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This Week in The IRON AGE

Vol. 153, No. 25 — June 22, 1944

Editorial

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Technical Articles

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Features

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News and Markets

o o o

Completely Equipped to Handle Any Assignment

Only a shop as completely and as modernly equipped as Mahon could handle the vast volume of diversified welded steel plate products that industry calls for today. Mammoth press brakes, for bending heavy steel plates—flame cutters, for cutting these plates—automatic welders—positioners—and much other essential equipment—enable Mahon workmen to maintain production schedules and produce the high caliber of work for which they are so widely known. Whatever the nature of the steel plate product you may require—large or small—heavy or light—you can safely rely upon Mahon facilities to produce it the way you want it.

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Above: Press brake operators bend the heavy steel plates required in fabricating this heavy welded base—produced by Mahon for a special purpose.

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Fabricators of Machine Bases and Frames and Many Other Welded Steel Plate Products

The IRON AGE

ESTABLISHED 1855

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June 22, 1944

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When the Flit Flies,

The Little Bugs Die First

ANYONE who has done gardening or farming even on a small scale must have been impressed by certain phases of birth, growth and death that are analogous to human life and accomplishment.

The start from a small beginning, the period of growth and productivity and the eventual withering away of root and vine find their parallels in all business and industrial undertakings. Most industrial "plants" are perennials, it is true, and a few may even turn out to be "century plants," but even these cannot hope to go on forever.

Nature, fortunately for us hungry humans, introduces another phase in the sequence of birth, growth and death. It is seed bearing and without it we would perish. The old produces, automatically, the provision for the new. There is no such convenient natural provision for keeping our industrial pastures green. Yet an industrial nation must find one or perish.

Fifty years ago 99 out of 100 of our healthy present-day industrial plants had not yet germinated or if so were mere seedlings. Fifty years hence the same statement will be true. But from what seeds are these future plants coming?

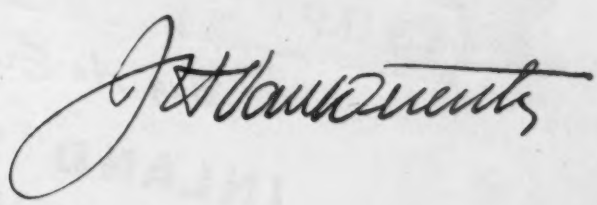
America has been fortunate in that while Nature has not provided either the seed or the soil for the beginnings of new enterprise, our rather loose and democratic system of government has. It has, until lately, given a man "a chance for his alley." If a man had a good idea for a new and useful product and could induce his friends to back him for a few thousand dollars, just as Henry Ford did more than a quarter century ago, he might plant a seed that would grow into a business that would not only generate unlimited employment but that would prove a bulwark in national defense.

These little new businesses, generated by the seeds of private initiative 25 years or more ago prospered through the reinvestment of earnings. What healthier way than this to make businesses grow? They had no particular appeal to the followers of the "big board" because their names and fames were then unknown. Bankers would not lend them a nickel.

Government's function, as I see it, is not to distribute free seeds of industrial enterprise, as it has done in the past with its lamentably political free seeds to farmers, but to provide the atmosphere and the irrigation that will enable little plants to get a good start and grow big. Unfortunately it has taken the standpoint that to do this it must proceed to hamper and handicap the large plants that are already in full bearing. In a well cultivated garden the big healthy plants do not squeeze and starve the small ones.

Our man-made tax laws of the present day do. They reward the businesses that can show the largest lists of investors, regardless of the outcome to them individually and collectively and they penalize the man and his partner who have "put their shirts" into their businesses and who have been independent of outside help.

Punitive action aimed at big business won't do the trick. Big business makes room and opportunities for little business. And when you aim the flit gun at business as a whole, remember that the little bugs die first!



Happiness Ahead!

There's a great day coming . . . if and when the war is won . . . a day when once again you'll be able to go adventuring on long motor trips, a day of greater abundance, better homes, and of hosts of new things that will make life more worth living.

It's a day worth saving for by buying as many war bonds as you can. And it's a day that may never come unless we all do buy our full share of war bonds.

SUPPORT THE 5th WAR LOAN

Buy An Extra War Bond Today!

INLAND STEEL COMPANY

Chicago 3, Illinois

The IRON AGE
June 22, 1944

NEWS FRONT

► Out of about 2800 foundries operative at the time of Pearl Harbor, some 200 have closed their doors due to decreasing income returns and labor troubles. Loss of these operations, along with reduced production in other foundry establishments' cut down output from about 15,500,000 tons made nationally in 1942 to little more than 12 million tons last year.

► Northrup's new P-61 Black Widow has proved itself to be so effective that Army and Marine Corps orders have materially stepped up production schedules and provided a backlog to keep the plant busy for two years.

Northrup and Joshua Hendy Iron Works have announced a new, jointly owned company, the Northrup-Hendy Co. for research and development on possible postwar developments.

► Possible decrease in mine production of copper by more than 25 per cent between Feb. 1 and July 1 may hurl copper back into the group-one shortage bracket. This slump is directly attributable to the loss of labor by the western mines.

► WLB has over 2000 forge and foundry wage cases before it and some are over a year old. There are more of these than for any other industry. WLB has promised to try and clean them up by July 15.

► Cleveland Trust business analysis says that business volume has dropped 3 per cent from a high last November to April of this year; factory employment down 3 per cent; munitions output by dollar volume 3 per cent; factory payrolls 2 per cent; and inventories 4 per cent.

► White collar workers are now averaging only 65 per cent as much as mechanical workers. In 1939 they averaged 85 per cent, showing the loss of ground.

► Lord Portal's emergency steel house for postwar use is now on exhibit in London. Pressed steel is used throughout, and aluminum foil is employed for heat insulation.

► Companies having electrolytic tinning lines are showing considerable interest in gas equipment for brightening the surface, to displace induction type heaters now in use. Of the Selas type, the double banks of gas burners move toward and away from the strip to give heat modulation, as tin thickness, strip speed, etc., dictates.

► Experimental work with high speed heating of forging billets has shown it possible to heat a SAE4340 billet, $5\frac{1}{2}$x$5\frac{1}{2}$x10 in. in size, to a uniform temperature of 2150 deg. in 19 min. There was no surface or internal cracking, decarburization and scaling was about 0.001 and 0.00025 in. respectively.

► The cancellation of Budd's large order for stainless steel cargo planes was the result mostly of slowness in fullfilling the order rather than for performance reasons. The latter was excellent, but only several planes have been made, and in the meantime many Douglas cargo planes are available.

Only 26 of the stainless planes will be made, and production will be cancelled this fall even if this number is not completed. Already about 1000 workers have been laid off, to be rehired later as shell work is speeded.

Budd will not make stainless planes after the war, feeling that the costs are high, and plane manufacture is more the function of intrenched aircraft companies.

► Although War Department officials maintain that the status of Republic Aviation Corp.'s contract for the P-47 remains unchanged, government officials in other departments are discussing what to do with the Farmingdale, N. Y., facility and employees when the contract is slashed.

► War Mobilizer James F. Byrnes predicts unemployment before the year is out because of heavy war production cutbacks to come even though the war with Germany continues.

► As a means to increase foundry output, wages in that field will probably rise even at the expense of possibly breaking through the Little Steel formula.

Metallurgy of the Gray I

GRAY cast iron is one of the most complex alloys used for an engineering application, and although a large amount of knowledge has been accumulated with regard to its production technique and the study of graphite, only recently has research been devoted exclusively to the gray iron matrix.

If gray iron is considered as an alloy steel in which are embedded flakes of graphite, its metallurgy insofar as it matrix is concerned becomes less complicated. It is fortunate that the matrix of gray iron is a true steel for much of the research conducted on steel will apply to gray iron. Although a gray iron may be classed as unalloyed, its matrix is always an alloy steel because of the high silicon content that is common to cast iron.

The properties of gray iron are dependent on two main structural characteristics: (1) The amount, type and distribution of graphite, and (2) the condition of the matrix. The cooling rate during and below solidification and the presence or absence of alloying elements and manufacturing practice are factors that govern the graphitic phase and determine the distribution of carbon between graphitic and combined states. The matrix will be affected by the same variables and conditions as in steel. Some of these are discussed in the following paragraphs.

The S-curves in Figs 1, 2 and 3, derived for gray cast iron, have contributed greatly to a better understanding of the gray iron matrix. The data for the isothermal diagrams are most commonly procured by metallographic examinations. Small specimens are austenitized (rendered austenitic) then rapidly transferred to a liquid bath maintained at the particular temperature level being studied, held for varying periods of time, withdrawn and quenched into water or brine. Specimens then are polished and examined microscopically, and any untransformed austenite will appear as martensite. Thus, progress of transformation of austenite at constant temperatures can be followed from beginning to end. S-curves present interesting and valuable pictures which enables a metallurgist to visualize at a glance the approximate manner in which austenite of a given composition will respond on cooling below the minimum temperature (critical temperature) at which austenite is no longer truly stable.

The shape of the curve and its position[4] on the diagram are governed by the chemical composition and grain size of the austenite. Alloying elements and an increase in austenitic grain size are conducive to a lazy austenite that becomes more reluctant to transform into ferrite carbide aggregates as the alloy content and grain size increases.

The characteristics of an eutectoid or approximately eutectoid matrix of a 3.0 per cent carbon, 2.0 per cent silicon gray iron with respect to transformation of austenite at constant subcritical temperatures is shown by the S-curve of Fig. 1, taken from Murphy, Wood and D'Amico.[1] The solid curve at the left depicts the beginning of austenite transformation to one of the decomposition structures such as pearlite, bainite, etc., and the curve farthest right represents the time taken to complete transformation of austenite. In the field marked A, austenite (A) has not started to transform. In the area between the curves representing the beginning and ending of austenite transformation, untransformed austenite (A), ferrite (F) and carbide (C) co-exist, the ferrite-carbide structure increasing and austenite decreasing the longer the sojourn at temperature. The field FC to the right indicates that all austenite has transferred to one of the ferrite (F) carbide (C) structures.

From approximately 1000 deg. to 1325 deg. F., austenite will transform to pearlite, the degree of fineness, decreasing from a coarse pearlite at 1300 deg. F. to a very fine nodular pearlite at 1000 deg. F. Below 900 deg. F. the transformation is according to the acicular mode with precipitation of the ferrite carbide aggregate, and bainite occurring at the austenite clevage planes. For prac-

FIG. 1—Isothermal transformation curve of 3.0 per cent total carbon, 2 per cent silicon gray iron.

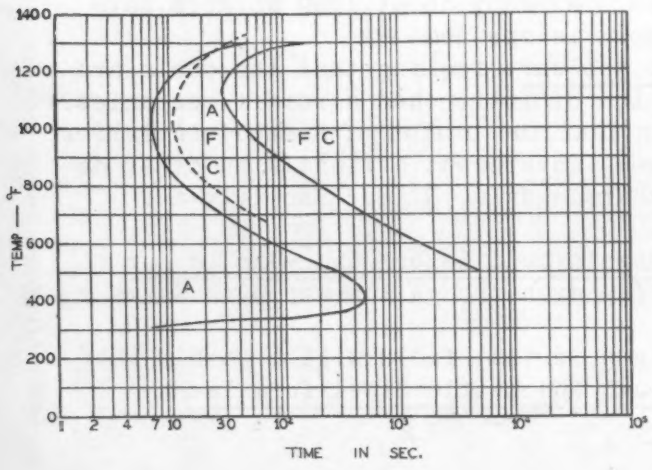
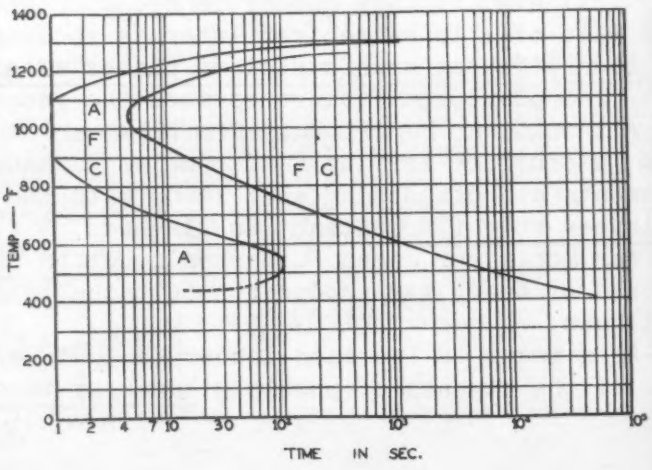


FIG. 2—Isothermal transformation curve of 0.79 per cent carbon, 0.76 per cent manganese steel.



Iron Matrix

BY R. J. HAFSTEN
Ensign, U.S.N.R.

tical purposes it can be said that austenite transforms to the martensitic structures below 400 deg. F., although some martensite may form during the cool to the isothermal temperature.[5] In the range of 900 deg. F. to 1000 deg. F., austenite appears to be unable to decide whether it wishes to form pearlite or bainite, with the result that the structures in this range resemble both.

Observations From S-Curves

It has been observed from the study of the gray iron S-curve that (1) all structures found in steel are common in gray iron,[3] all conditions being equal; (2) that the rate of austenite transformation is dependent on the temperature at which transformation takes place, and (3) the nature of the austenite decomposition product is dependent upon the temperature at which austenite decomposition occurred.

The curve of Fig. 2, from "U.S.S. Atlas of Isothermal Diagrams," is an S-curve of 0.79 per cent carbon and 0.76 per cent manganese steel. An examination of this will reveal that its shape is almost identical to that of the gray iron curve of Fig. 1 and proves that the gray iron matrix behaves as a steel, and that the existing store of S-curve data for steels can be profitably employed in cast iron metallurgy. In comparing Figs. 1 and 2 for the shortest time of austenitizing gray iron, transformation takes 7 sec., whereas the steel of Fig. 2 transforms in less than 1 sec. at the same temperature. This difference in behavior is probably due to the higher percentage of silicon and other elements present in the gray iron. Silicon[4] like most alloys will, if added in appreciable amounts, move the S-Curve to the right and increase the time for beginning of austenite decomposition.

. . . The comments herein should prove interesting to the average reader as it is in accordance with the present trend of thought, of considering gray iron as a mixture of steel and graphite. If gray iron is looked upon as being a graphitic steel, its metallurgy becomes less of a mystery and becomes readily understandable to the average technical man.

Austenitic grain size[6,7] is directly related to the period for beginning of austenite decomposition at subcritical temperatures and, therefore, must be considered when studying the gray iron matrix. An increase in grain size produces an accompanying increase in hardenability. The influence of austenitic grain size is at a maximum in that portion of the pearlite range where nucleation of pearlite is at the austenitic grain boundaries.[4,7] The broken line curve of Fig. 1 represents the beginning of transformation of a coarse grain austenite of the same analysis as the fine grain iron (solid curve, Fig. 1), and illustrates the relationship that exists between austenitic grain size and the speed of austenite transformation at temperatures below the critical.

The effect of austenitizing temperature and grain size on the isothermal transformation of a 2.97 per cent carbon, 2.02 per cent silicon iron at 1125 deg. F. is shown in Fig. 3, from Rote, Truckenmiller and Wood.[8] The time required for beginning of transformation becomes progressively greater the higher the austenitizing temperature, and is in accordance with the manner in which grain coarsening would proceed in a silicon-killed steel or gray iron to which no grain refiners were added. The mechanism of the change in hardenability with respect to austenite grain size is shown in Fig. 4, derived from data on Fig. 3. It should be noted at this time that on some of the isothermal diagrams, cooling curves are drawn to show certain reactions that involve continuous cooling of austenite. This is not absolutely correct for the isothermal diagram is applicable to transformation of austenite at constant temperatures only; neverthe-

FIG. 4—Influence of austenite grain size on the structure when austenite is cooled at a rate designated by A.

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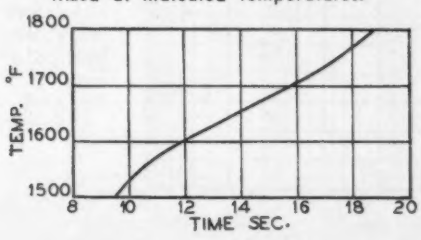
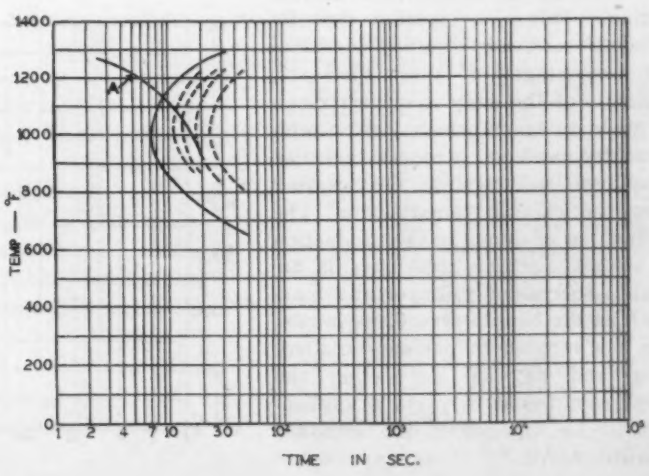
BELOW

FIG. 3—Time required for beginning of transformation of a 2.97 per cent total carbon, 2.02 per cent silicon gray iron at 1125 deg. F., after being austenitized at indicated temperatures.





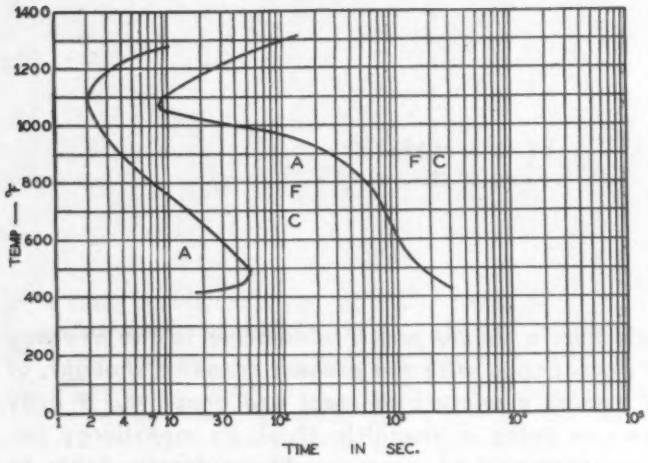


FIG. 5—Isothermal transformation curve of an unalloyed gray iron 3.63 per cent total carbon, 0.71 per cent combined carbon, and 1.75 per cent silicon.

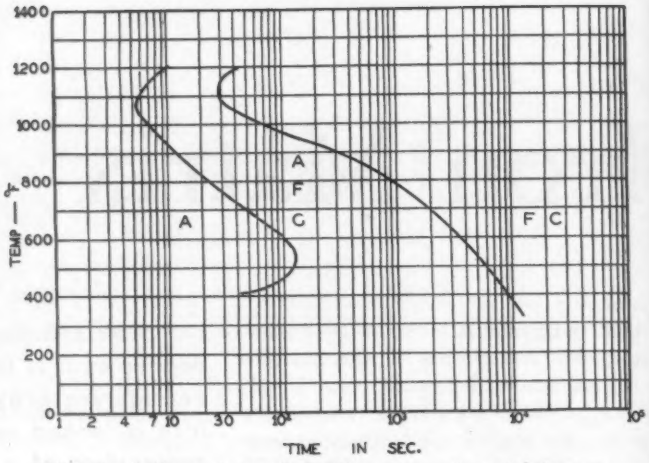


FIG. 6—Isothermal transformation curve of a nickel gray iron 3.68 per cent total carbon, 1.12 per cent combined carbon, 1.20 per cent silicon and 2.03 per cent nickel.

less, they are accurate enough for most purposes to be used as a guide for explanations involving continuous cooling. Actually the continuous cooling curve lies below and to the right of the S-curve.[9] Referring to Fig. 4, curves from left to right indicate increasing sluggishness of austenite resulting from an increase in austenitic grain size. If cooling curve (A) is a constant and austenite grain size, a variable, it can be seen that austenite of the gray iron matrix will transform at lower temperatures and will produce harder, stronger structures as the austenitic grain size becomes greater.

The primary functions of alloy additions to cast iron are to promote hardenability and to control the graphite phase. Alloy additions may also be made in cast iron to stabilize the carbide phase and prevent its dissociation to ferrite and graphite during heat treatment.[10,11] With the exception of cobalt[4] all of the other common alloying elements retard the rate of austenite transformation and shift the S-curve or a portion of it to the right, which indicates that a slower rate of cooling can be used to assure the austenite to martensite transformation. This also signifies that by judicious selection of alloy elements and percentages of these elements, austenite of the gray iron matrix can be made to transform at lower temperatures and to stronger acicular structures on cooling the casting from the casting temperature.[3] The application of alloys in the production of as-cast acicular structures is becoming increasingly important inasmuch as the bainite structures in cast iron are reputed to possess excellent wear and physical properties and have been found in certain applications to be superior to the orthodox pearlite matrix.[12]

Alloys and their relationship to hardenability can best be illustrated by examination of S-curves for alloyed and unalloyed gray irons. Comparing the curves of Figs. 5 and 6, taken from Hilliker and Cohen,[3] nickel induces hardenability by shifting the S-curve to the right. At 1050 deg. F., which is the temperature at which austenite is most willing to transform for the steels of Figs. 5 and 6, austenite will begin its transformation in the unalloyed iron in 2 sec., while in the nickel iron the transformation begins in approximately 6 sec. This means that heavier casting can be successfully heat treated.

Influence of Alloys

The curves of Fig. 7, from "U.S.S. Atlas of Isothermal Diagrams," demonstrate how easily alloys influence austenite into transforming on air cooling to the acicular structures, and also prove the feasibility of using S-curves already derived for steel to explain certain reactions in the matrix of gray iron. A soft iron of the analysis, 3.4 per cent total carbon, 2.40 per cent silicon and 0.75 per cent manganese had an as-cast structure that consisted of pro-eutectoid ferrite and coarse pearlite.[13] By the addition of 1.50 per cent molybdenum the tensile strength was raised from 27,200 to 52,400 lb. per sq. in. and the hardness from 170 to 277 Brinell. The alloy also changed the structure of the matrix from ferrite and pearlite to bainite. The mechanism of the change can be shown schematically by reference to Fig. 7. The broken line curve is the S-curve of a 0.35 per cent plain carbon steel and corresponds to the matrix of the unalloyed gray iron. The solid line curve represents a 0.35 per cent carbon, 0.82 per cent molybdenum steel and corresponds to the alloyed gray iron. On the same diagram is a cooling curve of a rate that might be obtained in the center of a 1-in. round if it were cooled in air. If the unalloyed 0.35 per cent carbon austenite is cooled at a rate shown by the cooling curve it will transform into pro-eutectoid ferrite in the pro-eutectoid field and into coarse pearlite, at (A) estimated hardness 177 Brinell. Alloyed austenite cooled at the same rate transforms, with the

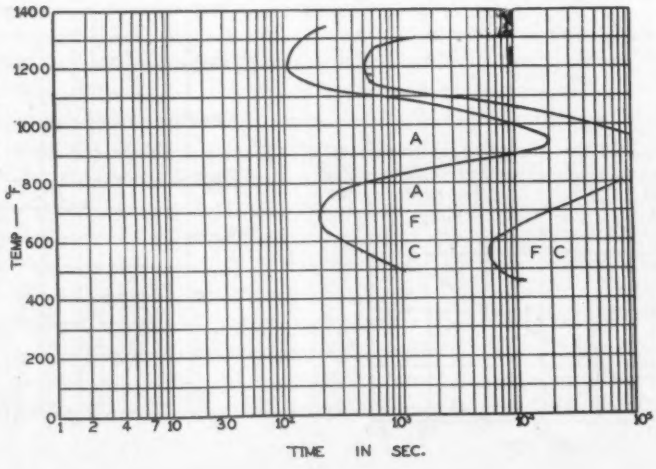


FIG. 9—Isothermal transformation curve of a 2.41 per cent total carbon, 2.48 per cent silicon, 1.10 per cent nickel, 0.98 per cent molybdenum gray iron, plotted on basis of 5 and 95 per cent of transformation.

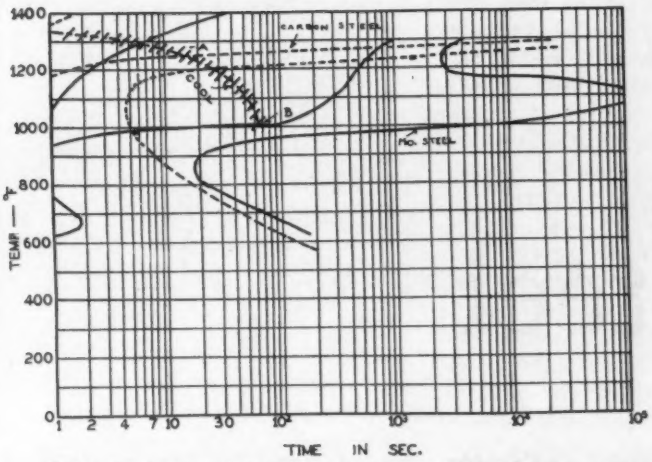


FIG. 7—Isothermal transformation curves of a 0.35 per cent carbon and 0.82 per cent molybdenum steel.

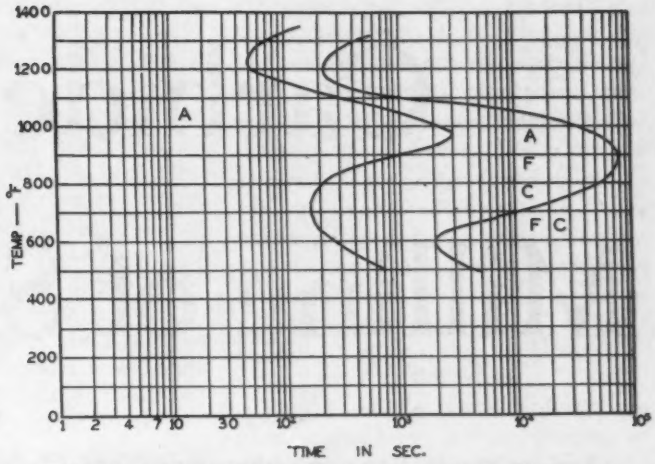


FIG. 8—Isothermal transformation curve of a 2.58 per cent total carbon 2.55 per cent silicon, 1.02 per cent nickel, 0.53 per cent molybdenum gray iron plotted on basis of 5 and 95 per cent of transformation.

exception of a small percentage that forms pro-eutectoid ferrite, into bainite, hardness 221 Brinell at (B) 1000 deg. F. It appears then that the main role of the alloy in this case is to suppress the transformation of austenite to pearlite and allow the austenite to transform at lower temperatures to the stronger acicular structures. Actually austenite does not transform on continuous cooling at (A) and (B), but a little below and to the right, as explained previously.

Figs. 8, 9 and 10 from Flinn, Cohen and Chipman,[3] show the S-curves of some high alloy gray irons. The rate of isothermal transformation is markedly retarded at all temperature levels. Molybdenum is very effective in forming a bay in the approximate temperature range of 900 deg. F. to 1000 deg. F., and it is in this range that austenite is most reluctant to begin its transformation. Because of the sluggishness of austenite in the range where pearlite is the decomposition product, acicular type structures can readily be secured in the as-cast condition. As the section of the casting becomes greater, the percentages of alloys must necessarily be increased if maximum physical properties of the gray iron in the as-cast or heat treated conditions are to be obtained.

It can be concluded from the foregoing that austenite of the gray iron matrix varies in its speed of transformation at different temperature levels below the critical, and that it is this variation that determines the characteristics of the S-curve and physical properties of the gray iron matrix in the as-cast or heat treated condition. Chemical composition and grain size of the austenite are the main factors that influence the shape and position of the S-curve and response of austenite to a given heat treatment.

Opinions or assertions contained in this article are private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

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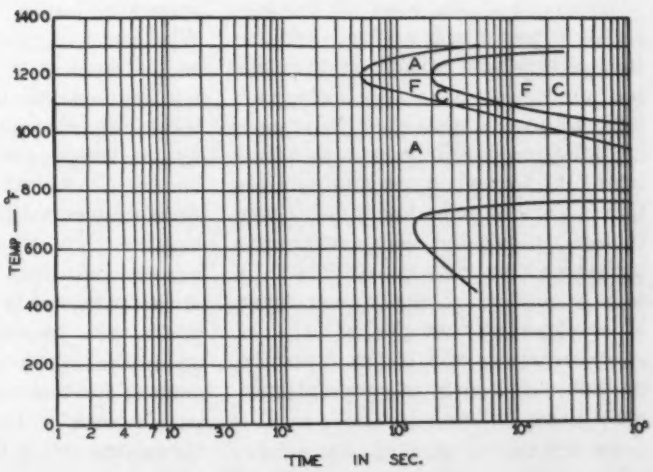

FIG. 10 — Isothermal transformation curve of a 2.56 per cent total carbon, 2.55 per cent silicon, 3.06 per cent nickel and 1.02 per cent molybdenum gray iron, plotted on basis of 5 and 95 per cent of transformation.

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[13] "Molybdenum in Cast Iron," Climax Molybdenum Co.

Carbide Milling of Steel

. . . Besides illustrating some phenomenal gains in output and cutter life by the use of negative angle carbide milling cutters over high speed steel cutters, the author presents test data in chart form demonstrating the relation of lead or bevel angle and the number of pieces obtained per grind, and the relationship between spindle horsepower and depth of cut, feed rate and width of cut. Cutter life tests are summarized. The material was originally presented at the Westinghouse Machine Tool Electrification Forum at Pittsburgh in May.

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LIMITATIONS of tungsten carbide as introduced to industry in 1928 made it inevitable that further developments make possible the use of this cutting material not only for cast iron and the non-ferrous materials but also for steel. The possibility of machining steel with a carbide first became a reality with the introduction of tantalum carbide in 1931. At about this time, industry's experience with negative angles in the single point tool machining of some non-ferrous materials, such as bronze, was translated to the machining of steel with single point tantalum carbide tools using negative angles.

This quite naturally led to experimentation with a flywheel cutter on milling machines in the machining of steel. The success of such cutters, at least with some restrictions in their application, indicated definitely that the milling of steel with multi-toothed cutters would become a possibility. Such machining operations, however, were left to the commercial development of a new carbide which appeared about 1938 in the form of tungsten titanium carbide. It was at this time that a multi-tooth cutter employing negative angles successfully milled steel at considerably higher rates of feed and speed than was hitherto possible.

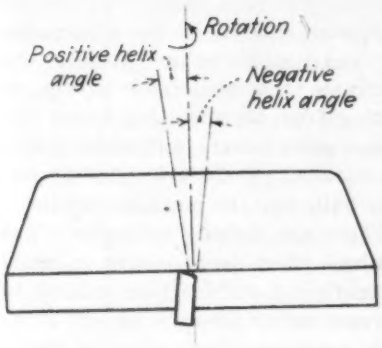
War's insatiable demands for material increased the use and application of this new carbide in the milling processes. At present, the carbide milling of steel is regular production procedure in numerous industries. Its peacetime use and application is assured and while it may never replace entirely the older cutting materials such as high speed steel, it is safe to assume at the present stage of development that the majority of steel operations will in the future be effected with benefit of carbide-tipped multi-tooth cutters.

Carbon milling of steel with tungsten titanium tips has been limited up to the present largely for such milling cutters as face, half side, shell end mills and slotting and slitting cutters. Inherent difficulties in the application and grinding of tips have thus far prevented its use in form cutters and such special applications as hobs. These obstacles may be circumvented or overcome but for the present it is not possible to predict or even advisable to consider the complete substitution of carbide for high speed.

Negative Angles

The technique of milling steel with carbide is presently limited to the use of negative angles both in the rake and the helix. This is not true if we included the lower Brinells and semi-steels where positive angles are quite effective. But for reasonable cutter life under every day shop conditions, negative angles for both rake and helix seem to be necessary to the success of this procedure in the milling of steel and its alloys. These angles are shown in the accompanying line drawings, Figs. 1 and 2.

As indicated at *B* in Fig. 2, cutting pressures with a negative angle are applied to the tip away from the cutting edge an amount approximately equal to the chip thickness. Whereas in the use of positive angles as indicated at *A* in Fig. 2, the cutting edge, which is the weakest and least supported portion of a carbide tip, is directly stressed by the cutting forces. It would seem, from these simple illustrations, that the use of negative angles in milling of the harder and more difficult materials to machine, such as steel and its alloys, are necessary. At any rate up to the present time, the development of the technique of carbide milling of steel is built largely around the incorporation of negative angles,



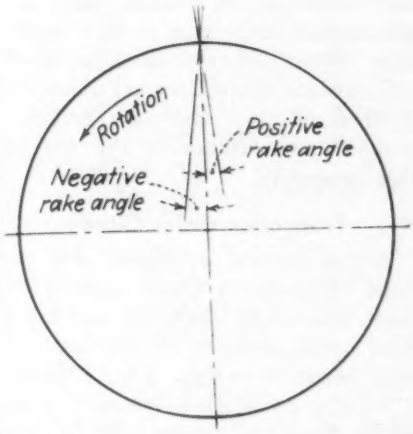


FIG. 1—Sketches illustrating positive and negative helix and rake angles with respect to the direction of rotation.

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both rake and helix, into carbide tipped cutters.

High Surface Speeds

This technique is characterized by the use of relatively high surface speeds. Friction and abrasion are carbide's worst enemies; the use of peripheral speeds that range from 500 to 1000 ft. per min. apparently lessens the abrasive effect of the carbide tip while in the work. There are indications that the lower surface rates (in the neighborhood of 400 to 500 ft.) are advisable for heat treated steels that are in the neighborhood of 375 to 425 Brinell. The untreated steels, both carbon and alloy, on the other hand, are being milled successfully at peripheral speeds as high as 800 to 1000 ft. per min. Where it is necessary to obtain a high finish (in the neighborhood of 15 to 20 micro-in.) a high surface rate and a relatively low chip load are necessary.

The results of considerable experimental work indicate definite advantage of high chip loads. It should be pointed out that a high chip load and good cutter life are related as cause and effect. The thicker the chip the farther from the cutting edge will the cutting forces be applied. This assists in preventing the breakdown of this cutting edge and thus increases the cutter life. A high chip load is also closely connected with a higher rate of metal removal per horsepower. Some of these results of a high chip load may be apparent from an examination of Fig. 2. Here, obviously, the thicker the chip the less effect the cutting forces will have on the unsupported and relatively weak cutting edge.

There follows from the characteristics already referred to, namely high surface speed and high chip load, the use of relatively high feeds in this technique of carbide milling of steel. Since the feed rate is dependent on the three factors of chip load, number of teeth and revolutions per minute, the use of high peripheral speeds and high chip loads will result in a high rate at which the workpiece is being fed into the cutter. These feed rates will vary, naturally, in different applications and will depend, among other things, upon the amount of power available. These rates will be discussed with reference to particular applications in a section devoted to such discussion.

High Horsepower Consumption

It follows from the above considerations that the horsepower consumed in carbide milling of steel is relatively high. Experimental work shows the increase of cutting forces necessary to remove metal with negative angles amounting to as much as 15 to 20 per cent. Since the peripheral speeds are five to ten times higher than those commonly employed with high speed steel cutters, the rate of applying these cutting forces and, therefore, the horsepower consumption is increased proportionately. Specific reference will be made to horsepower consumption in a section that follows, which is devoted to a compilation of horsepower data.

Since the feed rate depends upon the three factors of chip load, number of teeth and surface feet per minute, current practice limits the number of teeth employed in milling cutters. This pitch varies in different localities and among designers, but a "rule-of-thumb" that seems to strike an average of current practice throughout the country can be expressed by the diameter in inches plus two. Thus, a 4 in. cutter will have six teeth, a 6 in. cutter eight teeth, etc. The fundamental reason for employing coarse pitch cutters is the necessity for restricting horsepower consumption within reasonable limits. There seems, however, to be a further necessity for using fewer teeth in certain applications where a large chip accommodation space is necessary due to the width of the cut or the length of time the carbide tip is in contact with the workpiece.

Flywheel Effect

Because of the coarse pitch cutters that characterize current practice in carbide steel milling, flywheel effect seems essential. Attempts made to build such effect in cutter bodies is not, however, considered either good

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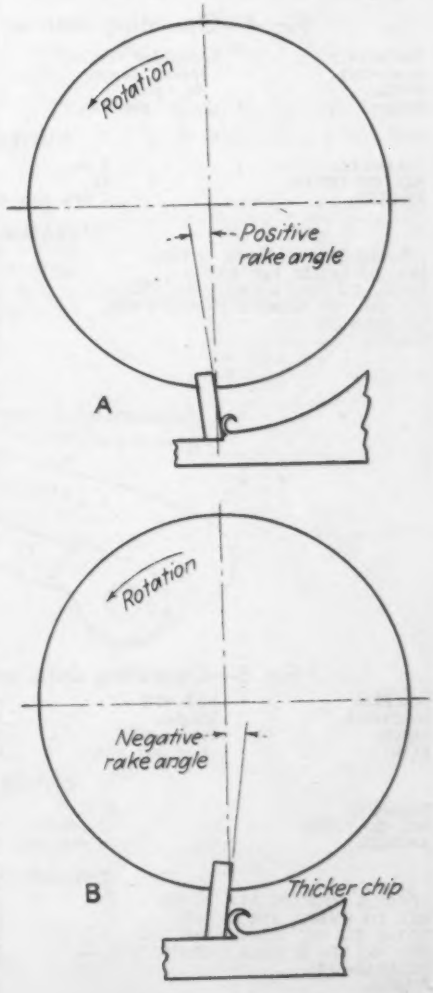
FIG. 2—Comparison of chip action with positive and negaitve rake milling cutter tips. At *A* the chip load comes directly on the cutting edge of the carbide tip, whereas at *B*, the cutting pressure is applied away from the edge an amount approximately equal to the chip thickness.



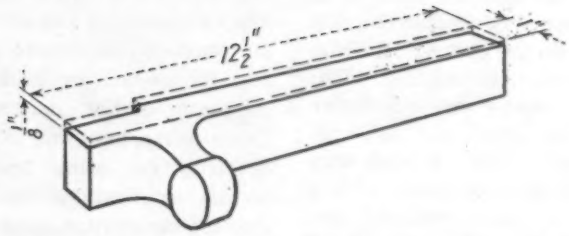


Fig. 3—Operating data on face milling operation on rack segment.

MATERIAL:	Steel forging	HARDNESS:	202 Br.
MACHINE:	No. 3 vertical	SPINDLE MOTOR:	10 hp.
SPEED:	1074 r.p.m.	SURFACE SPEED:	750 ft. per min.
FEED:	42 in. per min.	CHIP LOAD:	0.010 in.

CUTTER DATA

DIAMETER:	2½ in.
NO. OF TEETH:	4
ANGLES:	7 deg. neg. rake, 7 deg. neg. helix, 15 deg. lead

OPERATION RESULTS

SPINDLE HORSEPOWER INPUT:	8¾ hp.
NO. OF PASSES PER GRIND:	150
TOTAL CU. IN. METAL REMOVED:	234
CU. IN. PER SPINDLE HORSEPOWER:	0.6
TOLERANCES:	Plus or minus 0.001 in.
FINISH:	30-40 Micro-in.

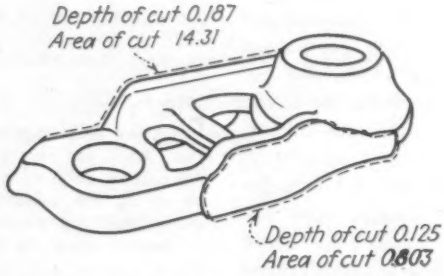


Fig. 4—Operating data on face milling of tractor links.

MATERIAL:	Annealed forging	HARDNESS:	185 Br.
MACHINE:	Special duplex	SPINDLE MOTOR:	7½ hp.
SPEED:	200 r.p.m.	SURFACE SPEED:	418 ft. per min.
FEED:	31 in. per min.	CHIP LOAD:	0.0129 in.

CUTTER DATA

DIAMETER:	8 in.
NO. OF TEETH:	12
ANGLES:	7 deg. neg. rake, 7 deg. neg. helix, 15 deg. lead

OPERATION RESULTS

SPINDLE HORSEPOWER INPUT:	12
NO. OF PASSES PER GRIND:	125
TOTAL CU. IN. METAL REMOVED:	663
CU. IN. PER SPINDLE HORSEPOWER:	1.43
TOLERANCES:	Plus or minus 0.0005 in.
FINISH:	Superior to H.S.S. cutters

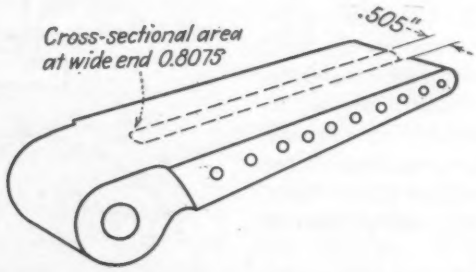


Fig. 5—Operating data on milling slot in wing hinge.

MATERIAL:	SAE 4340	HARDNESS:	402 Br.
MACHINE:	Simplex	SPINDLE MOTOR:	15 hp.
SPEED:	264 r.p.m.	SURFACE SPEED:	552 ft. per min.
FEED:	13 in. per min.	CHIP LOAD:	0.0041 in.

CUTTER DATA

DIAMETER:	8 in.
NO. OF TEETH:	12 effective
ANGLES:	15 deg. neg. rake, 0 deg. helix

OPERATION RESULTS

SPINDLE HORSEPOWER INPUT:	18.5
NO. OF PASSES PER GRIND:	35
TOTAL CU. IN. METAL REMOVED:	183.4
CU. IN. PER SPINDLE HORSEPOWER:	5.7
TOLERANCES:	Plus or Minus 0.0005
FINISH:	20-30 micro-in.

design or effective in the elimination of undesirable impact loads. To eliminate these undesirable effects, resulting from large cutting forces and coarse pitch cutters, a flywheel should be installed on the arbor, or preferably built into the machine spindle.

There are definite indications that flywheel effect is necessary in some categories of carbide steel milling to increase cutter life and also to eliminate excessive depreciation of equipment. The full, definite and specific results of flywheel effect will come only, however, from much more experimental data than is now available. What information is at hand supports the contention that a definite flywheel effect is necessary for economical performance in the use of this procedure.

Production Gains Cited

A few typical examples will be cited of gains in speeds and feeds made possible by changing over from high speed steel to carbide cutters with negative angles. Fig. 3 shows a regular production operation converted from high speed steel to carbide, permitting an increase in feed rate from 4½ to 42 in. per min. and an increase in spindle speed from 54 to 1074 r.p.m. The number of pieces obtained per grind increased from 100 to 150 with the conversion to carbide and the finish of 30 to 40 micro-in. obtained is an appreciable improvement over that obtained with high speed steel, which was estimated at 60 micro-in. The production in this instance was increased approximately ten times.

The operation of face milling the tractor link shown in Fig. 4 was performed on a special duplex milling machine, each spindle of which is powered by a 7.5 hp. motor. By converting from high speed steel to carbide face mills, the feed rate was increased from 11 in. to 31 in. per min. and the speed from 57 to 200 r.p.m. The 8-in. cutters used had wedged solid carbide blanks instead of brazed tips. The metal removed with this type of cutter was 663 cu. in. per grind as compared with 365 cu. in. for the brazed tip milling cutter under identical conditions.

Milling of the slot in the aircraft wing hinge, Fig. 5, presents an interrupted cut, which is detrimental to the life of the carbide tips. The conversion from high speed steel to carbide tipped cutters resulted in an increase in the feed rate for ½ in. per min. to 13 in. The spindle speed was

stepped up from 25 to 264 r.p.m. Perhaps the most outstanding feature of this operation, which is a regular production run, is the increase in cutter life from 11 hinges per grind to 35. In addition, the tolerances are much closer—for parallelism 0.0002 in. is maintained; for width 0.0005 in. The finish with carbide tipped cutters is far superior to that of high speed steel; a 20 to 30 micro-in. finish is a conservative estimate.

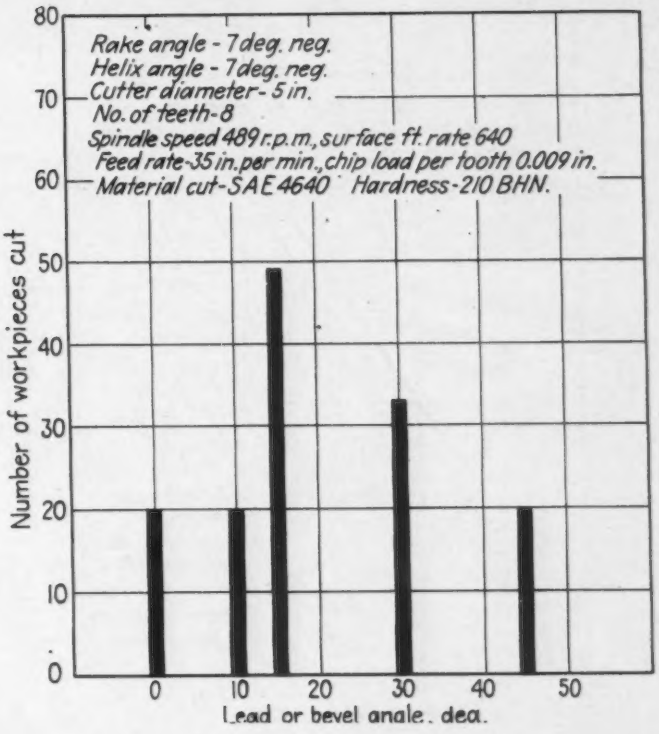


FIG. 6—Number of pieces per grind using various lead or bevel angles.

Comparative Data

Fig. 6 shows the relationship between the number of workpieces cut and the lead or bevel angle of the cutter. The cutter used in these tests was a 5 in. diameter face mill, having eight teeth with 7 deg. negative rake and 7 deg. negative helix. It is interesting to note that the number of passes for 0, 10 and 45 deg. lead angles is the same, namely 20. The 30 deg. lead angle shows an increase in the number of passes to 33, while the 15 deg. lead angle results in a cutter life equal to 49 passes. While these results may not be absolutely conclusive, they indicate a tendency of the effect of lead angle on cutter life for this particular cutter. It may be that different peripheral and feed rates will result in a different cutter life than that indicated in this graph.

The results of test showing the relationship between depth of cut and horsepower indicates a straight line relationship, Fig. 7. Since the ratio is greater than one, the increase in horsepower is proportionately less than the increase in the depth of the cut. In other words, if the depth of cut is doubled, the horsepower does not increase 100 per cent. Increasing the depth of cut from 0.050 to 0.100 in., for example, increases the horsepower from 6 to approximately 10½.

In this graph, Fig. 8, showing the relationship between the horsepower and the feed rate, the curve is approximately a straight line, although here again the horsepower does not increase proportionately at the same rate as the feed rate. Thus, it is possible to increase the feed rate from 20 to 40 in., while the horsepower increases from 39 to only 67.

The graph, Fig. 9, representing the relationship between spindle horsepower input and the width of cut with a constant diameter cutter is interesting in that the curve approximates a double reverse or "S" type curve. The ratio between the no-load horsepower and the actual cutting horsepower for the smaller widths of workpieces is smaller than the ratio of no-load horsepower to actual cutting power for the wider width workpieces. The rate of increase in power is less than 3 to 5 in. as indicated in the graph, than it is from 1½ to 3 in. Two factors should be noted as playing an important part in this relationship: First, the entrance angle with the smaller workpiece is decidedly positive as compared with a true negative entrance angle with a 5 in. workpiece. Second, the wider workpiece involves a longer arc of carbide cutting tip contact and hence relatively greater power consumption.

The interesting series of curves shown in Fig. 10 indicate the increase

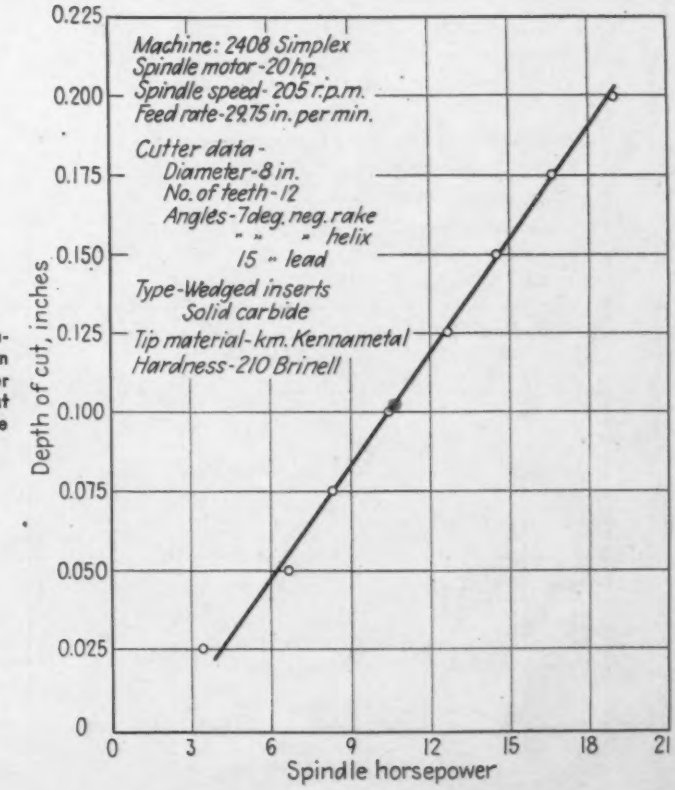


FIG. 7—Relationship between spindle horsepower and depth of cut using negative angle milling cutter.

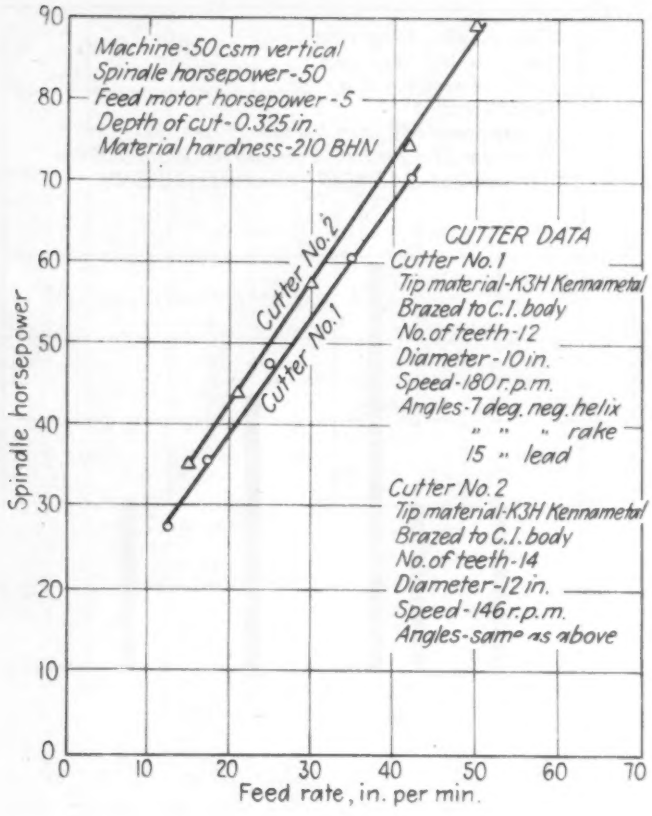


FIG. 8 — Relationship between spindle horsepower and feed rate using negative angle milling cutters.

in horsepower with an increasing number of passes. Use of a 45 deg. lead angle calls for an increase in horsepower immediately after the first pass. This is likewise true for the 30 deg. lead angle, the 0 and the 10 deg. as indicated by the curves. The most striking characteristic of these curves is the fact that there is no increase in horsepower with a 15 deg. lead angle until just prior to the breakdown of the tip. The power then increased from 33 to 42 hp.

Cutter life tests are summarized in the accompanying table. The tabulation is largely self-explanatory but is deserving of the following comment: It will be noted that both brazed and wedged type face mills are included in these tests. Without exception, the wedged type cutters show from 100 to 300 per cent increase in total cubic inches in metal removed per grind. The note at the bottom of the tabulation indicates that these cutters were operated to the point where a reasonable regrind was necessary and not a complete tip breakdown.

This information is not presented as being entirely conclusive, for considerable additional experimental and production experience is necessary, but certainly the results indicate very definitely the benefits of the wedge tip whose original strength is in no way lessened as is true of the brazed tips. There is every reason to believe from these results that laboratory tests indicating a reduction of 60 per cent in carbide strength due to brazing, hold true on the production line. This conservative statement regarding advantages of wedge tips versus brazed tips does not, of course, include such an obvious advantage as the lower cost of reconditioning.

Conclusions

Carbide milling of steel is not only a possibility but an actuality on the production line. This does not mean that all operations will in the future be converted from high speed steel cutters to carbide tipped cutters. Indications exist, however, that the majority of steel milling operations will be performed with carbide.

Considerable experimental work remains to be done regarding optimum angles. Present indications point to the advantageous use of a combination of 7 deg. negative rake and 7 deg. negative helix for general milling purposes in face and half-side milling operations. In slotting, definite results over long production runs indicate that a 0 deg. helix and a 15 deg. negative rake represents a combination remarkably effective in the milling of different workpieces.

The relationship between cutter diameter and face width of workpiece is important. From the above data, it is obvious that this relationship should be in the ratio of approximately 8 to 5. A larger ratio results in a disastrous entrance angle, which lessens cutter life; a smaller ratio results in lessened cutter life due to prolonged contact of carbide tip with workpiece. This may also be due to chip confinement when the arc of cutting ranges from 150 to 180 deg. This latter effect can apparently be eliminated by increasing the peripheral speed which assists in throwing the chips clear. It may also be noted that with an increase in the peripheral speed, the chip load is reduced and

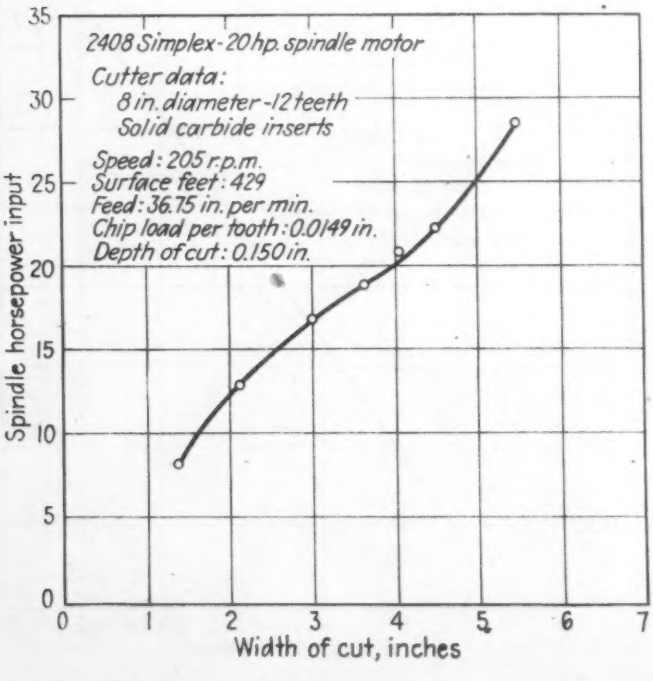


FIG. 9 — Relationship between width of cut and spindle horsepower input.

this may assist in eliminating the disadvantages of a large workpiece width as compared with the cutter diameter.

There are definite indications that a carbide tipped face mill cannot be used in a confined cut where the arc of contact between the tip and workpiece is 180 deg. Adequate chip clearance can be provided for such an operation by using a fly cutter, a very coarse pitch cutter or by radically reducing the chip load by increasing the peripheral speed as indicated above.

If brazed tip cutters are used, extreme care must be exercised both in the brazing and in the grinding. Cold treatment is helpful in relieving brazing strains as shown by an appreciable increase in cutter life when brazed carbide tipped cutters are subjected to a cold treatment of 120 deg. F. below zero for 2 hr.

Results thus far obtained with solid wedged carbide blanks in both slotting and face mill cutter bodies definitely point to the advantages of this type of construction. The results are apparent not only in increased cutter life, as much as 200 to 300 per cent, but also in reduced cost of cutter maintenance. The wedged type of cutter can easily be adjusted for successful grindings; a broken blade can be readjusted and the cutter ground and placed back in service within a few hours. A broken tip in a brazed cutter results in the cutter being out of use for at least 12 hr.; the brazing necessitates regrinding of the bore and frequently the spindle nose recess.

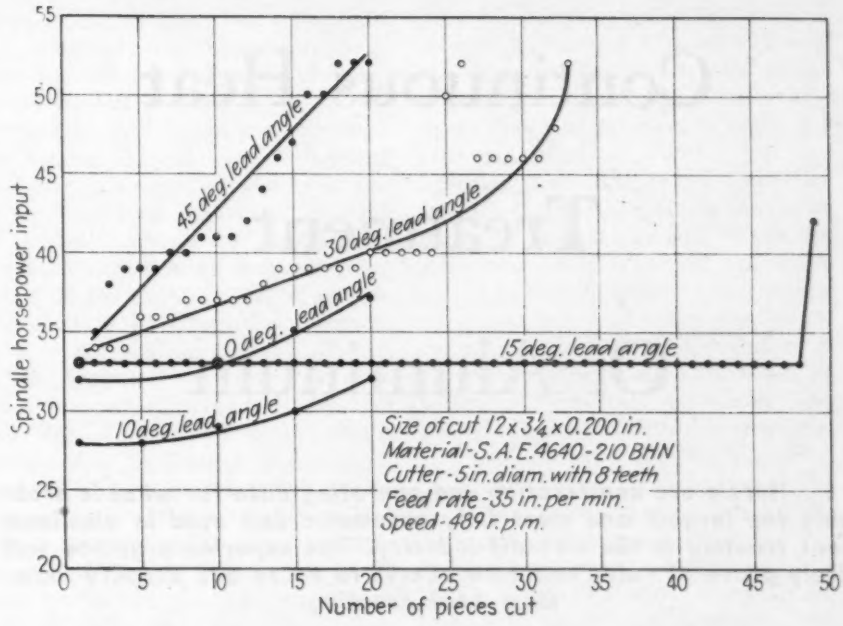


FIG. 10—Cutter life tests showing the number of workpieces cut and the spindle horsepower input for various lead or bevel angles.

CUTTER LIFE TESTS
NEGATIVE ANGLE MILLING CUTTERS

CUTTER DATA						SIZE OF WORKPIECE			MATERIAL CUT		OPERATING CONDITIONS					RESULTS				
DIAM. IN.	NO. OF TEETH	APPLICATION OF TIP	RAKE DEG.	HELIX DEG.	LEAD DEG.	LENGTH, IN.	DEPTH, IN.	WIDTH, IN.	SPEC.	BRINELL HARDNESS	SPEED, R.P.M	SPEED, S.F.M.	FEED, IN./MIN.	CHIP LOAD PER TOOTH	MACH. TYPE	NO. OF PASSES	SPINDLE HP.	CU. IN. PER PASS	TOTAL CU. IN. REMOVED	CU. IN. PER HP.
2.5	4	BRAZED	7 NEG.	7 NEG.	15	12.5	0.100	1.375	4640 FORG.	210	815	534	25	0.008	50 CSM VERT.	40	11.5	1.72	68.8	0.299
8	10	"	"	"	"	"	"	5.310	"	"	275	576	17.5	0.0065	50 CSM HORIZ.	28	17.5	6.64	186.0	0.531
"	12	WEDGED	"	"	"	"	0.150	3.56	"	"	205	429	29.25	0.012	2408 SIMPLEX	54	15.2	5.93	321.0	1.04
"	"	"	"	"	"	12.25	"	3.00	"	"	222	465	30	0.0112	50 CSM HORIZ.	50	20.5	5.54	277.0	0.659
"	"	"	"	"	"	12.38	"	"	"	"	205	429	36.75	0.0149	2408 SIMPLEX	17	16.75	5.74	97.5	0.987
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	27	"	"	155.0	"
"	"	"	"	"	"	IRREGULAR SHAPED WORKPIECE			ANNEAL FORG.	185	200	418	31	0.0129	SPECIAL DUPLEX	61	12 L.H.	5.36	328.0	1.430
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7.6 R.H.	2.0	122.0	0.562
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	125	12 L.H.	5.36	670.0	1.430
"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	7.6 R.H.	2.0	250.0	0.562
"	"	"	"	"	"	52	0.150	5.00	4640 FORG.	209	205	429	29.25	0.012	2408 SIMPLEX	17	34.5	39.0	663.0	1.013
"	10	BRAZED	"	"	"	12.5	0.125	5.38	"	210	222	465	30	0.0135	50 CSM HORIZ	13	29.5	8.4	109.0	0.684
6	8	"	"	"	"	12.25	0.150	3.00	"	"	250	392	29.25	0.014	2408 SIMPLEX	12	14.5	5.4	64.8	0.907
8	10	WEDGED	"	"	"	32.75	"	5.50	"	"	205	429	36.75	0.0179	"	13	28.7	27.0	351.0	1.06
"	"	"	"	"	"	"	0.225	3.63	"	"	"	"	"	"	"	8	28.14	26.7	214.0	1.09
"	"	"	"	"	"	52	0.150	5.5	"	"	"	"	29.25	0.0142	"	12	"	42.9	514.8	0.86
"	"	"	"	"	"	"	"	3.5	"	"	250	512	"	0.0119	"	"	19.05	27.3	328.0	0.82
"	"	"	"	"	"	54.5	"	5.5	"	"	380	796	"	0.0077	"	9	28.14	45.0	405.0	0.63
"	"	"	"	"	"	"	"	3.563	"	"	250	512	36.75	0.0147	"	12	21.4	29.1	349.1	0.92
"	"	"	"	"	"	52	"	5.5	"	"	205	429	29.25	0.0142	"	13	28.94	42.9	558.0	0.85

ALL CUTTERS WERE FACE MILLS AND WERE RUN TO SUCH A POINT REQUIRING A REASONABLE REGRIND

Continuous Heat Treatment Of Aluminum

BY J. O. LAWS
Assistant Process Engineer, Texas Division, North American Aviation, Inc. Dallas

. . . Herein are construction and operating data for what is probably the largest and most fully automatic unit used in aluminum heat treating in the aircraft industry. The experience gained will likely prove of value in future efforts to refine and simplify aluminum heat treating.

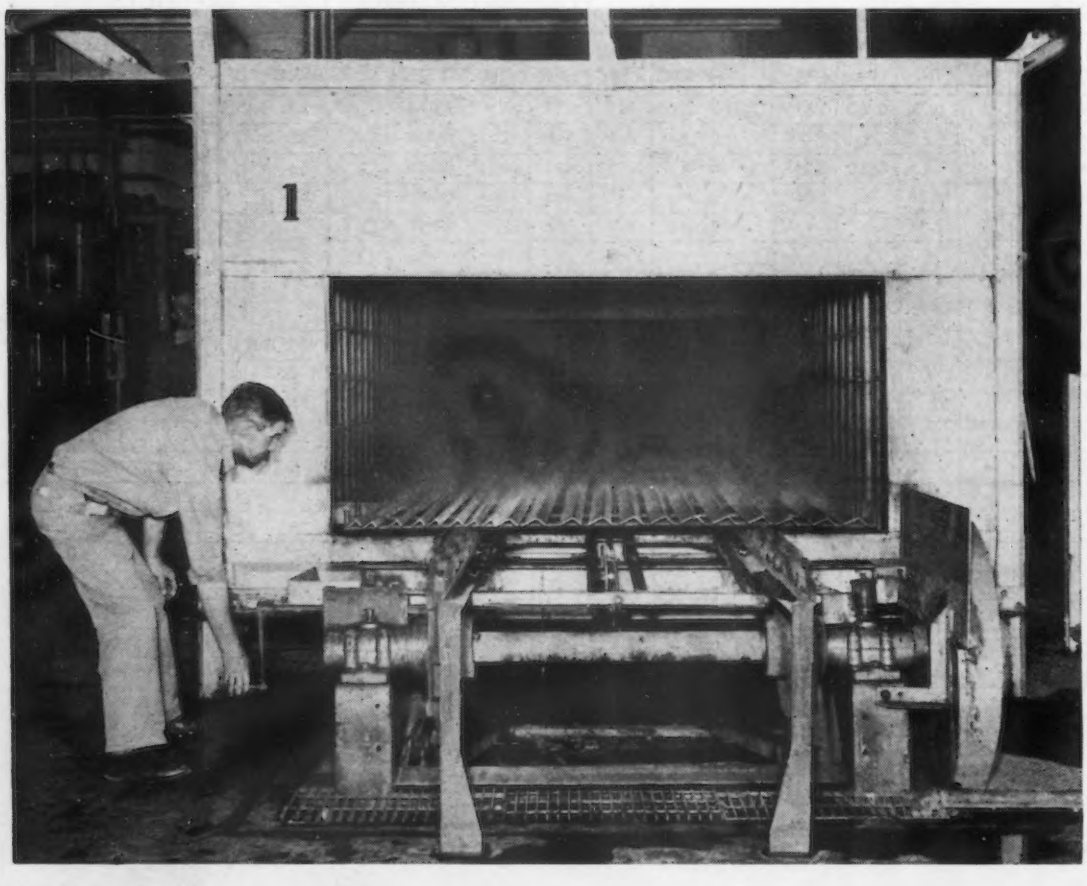
AN automatic heat treating furnace, designed to approximate continuous operation, is being used by the Texas Division of North American Aviation, Inc. in processing aluminum parts going into Liberator bombers. This furnace (built to North American design specifications by the Despatch Furnace Co.) is probably the largest and most fully automatic unit used in aluminum heat treating in the aircraft industry.

The operation of the furnace is briefly as follows:

Parallel conveyor chains, running in guides along the floor of a tunnel-like heating chamber, carry racks of aluminum parts from a loading position into the furnace. The conveyor automatically stops; the entrance door closes; and the conveyor remains at rest for a predetermined interval. During this time, another load is placed on racks just outside the entrance door.

When the predetermined waiting time has elapsed, a warning bell rings, the doors (both entrance and exit) open and the conveyor moves forward a distance just sufficient to bring the second load into the heating chamber. The doors again close as soon as the conveyor comes to rest.

In this manner, two to five loads are moved into the heating chamber before the first load reaches the exit door. As the first load leaves the furnace, it enters a quenching chamber. A water valve automatically opens and precooled water is pumped



QUENCHING chamber from the unloading end, showing how the unloading platform has been lengthened to care for long material. The operator is turning a crank which lifts the load off the conveyor and moves it out the end of the quench chamber. This facilitates unloading of long parts.

through spray nozzles that line the side walls, top and bottom of this "fog" chamber. After a suitable quenching time, the water valve closes and the discharge from the pumps is returned to lines leading to water-cooling towers.

When the load reaches the end of the quenching chamber, the parts are removed from the racks, and the racks are wheeled back to the loading end of the furnace.

Except for loading and unloading, the furnace is completely automatic.

The 40 ft. heating chamber will accommodate loads 6 ft. wide and 2½ ft. high. Electrically heated air is forced into this tunnel-like chamber through ports in the side walls near the floor and passes upward through and around the load to a checkerboard of louvres in the ceiling. These louvres are adjustable so that areas of high and low temperature may be "ironed out" by opening or closing some of these closely-spaced ports.

The air is heated by four Nichrome elements, a pair of elements being situated on top of and near each end of the heating chamber. The elements at the loading end are of 140 and 60 kw. capacity and those at the exit end are of 100 and 80 kw. capacity. Switches are provided that make it possible to use any combination of elements. During periods of idleness, the temperature may be maintained by using only one element in each unit without putting excessive loads on the current supply.

The fans that circulate air through the heating elements and the heating chamber have rated capacities of 10,500 and 8,000 cu. ft. per min. at 1000 F. Airflow switches are provided for turning off the heating elements in the event of fan failure and, of course, over-heating switches are incorporated in the heating element circuits.

Temperature is controlled between the specification limits of 910 deg. and 930 deg. F. by two potentiometer pyrometers (indicating and recording) which are connected with thermocouples situated near each end of the heating chamber. These controls are the off-on type and are sufficiently sensitive to maintain the temperature between about 915 deg. and 925 deg. F. The "cold" and "hot" areas of the heating chambers, except for cool zones extending 1 ft. inward from the doors, have been brought to within 5 deg. F. of the general average by adjustments of the louvres.

The quenching chamber in the original design was 9 ft. long and contained 384 nozzles. To permit the quenching of longer loads, this "quencher" was lengthened by North American to 14 ft., and the piping was redesigned to accommodate nozzles with larger passages. The present quenching chamber contains 405 nozzles of a design that is less easily clogged, but produces a dense fog spray that is so essential to rapid and even quenching.

Water is supplied to the nozzles by two 325-ft. head centrifugal pumps at a rate of 225 gal. per min. When the automatic valve turns off the water in the quenching chamber, the pumps force the water through a pressure relief valve and begin circulating it through cooling towers. The use of a circulating system and cooling towers is necessitated by the temperature of the plant water (90 deg. F.) which is obtained from company wells. The same circulating system supplies the quenching chambers of two other aluminum heat treating furnace.

The automatic control circuit is adjusted by making settings on four electrical timers. The first timer controls the heating time by metering the interval between movements of the conveyor. The second timer adjusts the conveyor movement to the length of load by metering the time during which the conveyor motor is energized. The third timer controls the start of quench by closing a contact which opens a water valve after the conveyor motor has run for a preselected interval. The fourth timer controls the duration of quenching by closing

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THE potentiometer pyrometers, which record the temperature of the furnace atmosphere at either end of the heating chamber and switch the heating elements on and off to maintain the desired temperature. The automatic control circuit is adjusted by making settings on electrical timers shown at the left.

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the water valve after a preselected quenching interval.

Those familiar with aluminum processing will recognize the unconventionality of this "robot" furnace. Ordinarily, the heating chambers of air furnaces do not exceed 20 ft. in length and the furnaces are designed to heat treat one load at a time. Parts are customarily hung on racks that are designed to fill the heating chamber. The furnace door is opened by a hand-operated air valve and two or three men push the loaded rack along a track which guides it into the heating chamber. Loads are usually extracted from the furnace by manually controlled mechanisms.

The advantages of automatic operation are manifest. Fewer men are needed to operate the equipment and a stricter control over heating time and the beginning of quenching can be maintained.

The advantages of a long heating chamber built around a conveyor are twofold. In the first place, the long stringers used in the B-24 bombers can be processed with ease in the 40-ft. heating chamber. Secondly, by using short loads and having several loads in the furnace at the same time, a continuous flow of parts can be approximated.

If the thickness of the parts is such that they require heating for 30 min. and if five loads are heated at the same time, a new load enters the furnace every 6 min. and a finished load is removed from the quenching chamber every 6 min. Two men are kept busy—one at the loading end of the furnace, placing parts on the racks, and one at the unloading end, removing the quenched parts.

Having a nearly continuous flow of freshly heat treated parts is of considerable advantage when it is planned to form the parts in an unaged condition and, while the furnace has not yet been put to this service, the possibility of this adaptation influenced the orginal design. In this scheme of fabrication, the characteristics of 24S alloy to harden gradually after quenching is utilized to form parts with relatively deep draws before the material ages to its full rigidity. In this way parts are formed from heat treated material and the time-consuming work of removing warpage from parts heat treated after forming is avoided.

Because the 24S alloy begins to harden appreciably about an hour after quenching, it is necessary to form the parts very soon after quenching or to place the parts into cold storage in order to retard the age hardening. By properly coordinating the loading of this furnace with the output of the forming machines, a steady flow of unaged parts can be supplied without storage in refrigerators.

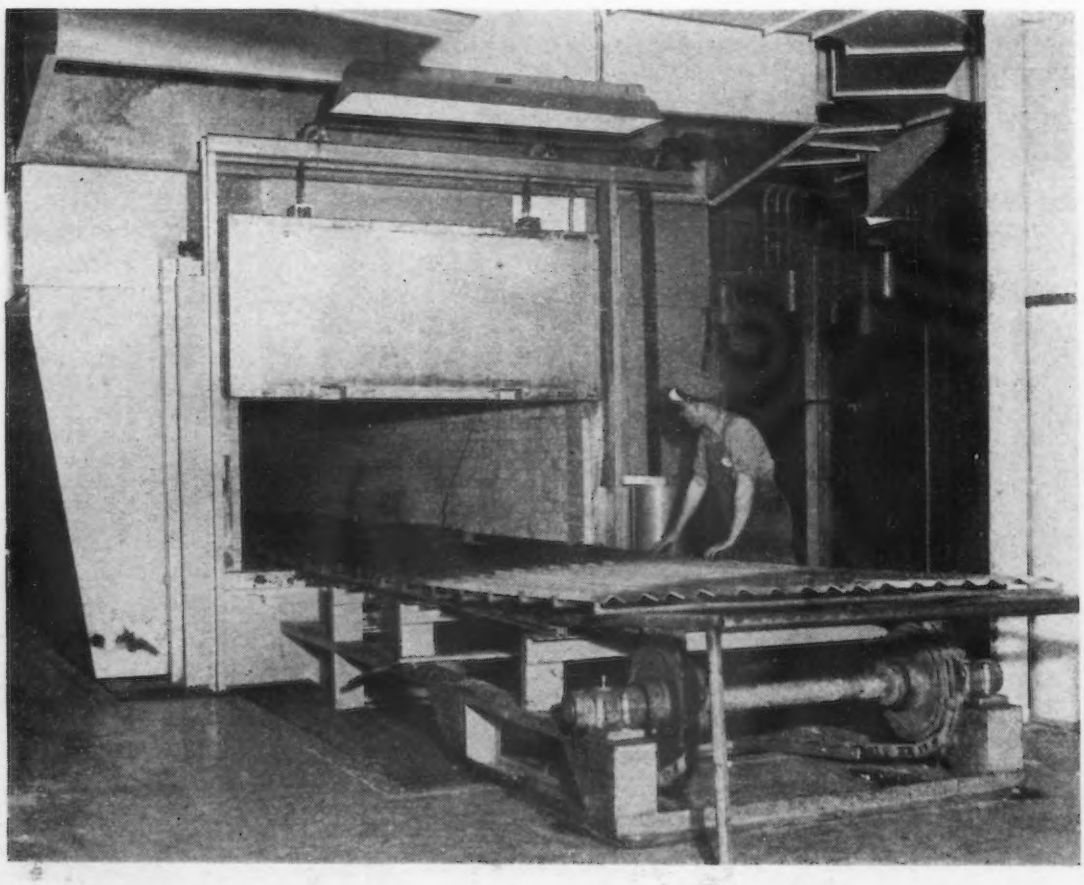
As might be expected, experience has indicated the need for several changes in the original design. A brief description of these changes should be of interest.

Conveyor movement: In the original design, the length of conveyor movement was controlled by energizing the conveyor motor for metered time intervals. This control was found to be inadequate, because the conveyor coasted varying distances after the motor was de-energized.

The length of conveyor movement is the most critical setting that has to be made on the automatic control panel. A load must be moved a distance of 40 ft., in several steps, and arrive at a position in front of the exit door with a leeway of only a few inches. Every inch that is allowed for variation in this distance must be subtracted from the length of load and, consequently, from the capacity of the furnace.

The precision of control was improved by adding a new circuit which automatically energized the reverse coil of the conveyor motor at the instant its forward coil was de-energized, thus applying a breaking ac-

(*Continued on Page* 126)



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THIS photograph of the entrance end of the heating chamber of the automatic heat treating furnace used by the Texas Division of North American Aviation, shows how the loading platform was lengthened to handle long material.

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Design For Postwar Planning

. . . Too much postwar planning is just conversation. Another too large portion consists of speakers and writers insisting on presenting all of the problems but none of the answers. Likewise, few substantial plans of attack on these problems which can be adopted other than individually have been presented. To this end THE IRON AGE, working with an industrial planning organization, presents a basic attack for a primary phase of postwar planning for manufacturers.

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BY DONALD C. MAC DONALD
Cleveland Regional Editor, THE IRON AGE

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AMONG the greatest of the problems confronting the manufacturer with an eye to the postwar world is that of his future product. In many cases, conversion to war production has merely meant halting production of a peacetime product and turning the machines to the tasks of war production, using a slightly different set of specifications or a slightly altered material but permitting the shop to continue much as it had previously.

The problem of re-engaging in the peacetime markets and determining the postwar product for this shop would appear on the surface to be simple. But this is not necessarily so. What is the shop's peacetime competitor going to make? Have technological advancements since the beginning of war production made obsolete the former product's design? Is the market for the product still there in view of possible substitutes which have taken the product's place during the war emergency? These and probably at least a hundred other questions arise to disturb the calm of the complacent manufacturer.

In the second instance there is the case of the shop which suffered almost a complete changeover during conversion to war production. Now that the mechanical equipment of the shop has been so severely altered, since the material flow in the shop and processing procedure has been changed and new operating methods have taken the place of older facilities, what product should be adopted for postwar production? If a new product is considered will the present war-bought equipment suffice for its production? What are the competitors doing? Should a new product or merely a redesigned version of the former product be adopted? Last, but not least, how should a company go about getting the answers before plunging financially into a questionable enterprise?

The obvious answer is to make a logical analysis of all of the factors involved. Since this is not as simple as it may sound, due to the many ramifications which are sure to be encountered, a thoroughly developed check list of facts to be determined and considered provides a first key.

Designers for Industry, Inc., Cleveland, has provided a typical check list which is broad enough in scope to serve as a research guide for nearly any type of manufacturer who wishes to investigate the possibilities of either a new product or a redesigned version of a former product.

The check list is designed in such a way that it will serve as an outline for a cursory check of the major advantages or disadvantages of a potential product; or, if carried slightly further, as an outline for a weighted survey, or, if used in still more detail, as the basis of an exhaustive investigation of product, facilities and market.

With such a chart, as a typical example to suggest the multitudinous avenues for information and factual data necessary before embarking on the manufacture of a product, any manufacturer should be able to easily

Table I

Patent Situation

	Factor Favorable to Our Making Product	Factor Unfavorable to Our Making Product	Need More Information to Decide
(1) Status of design and mechanical patents? In United States, Canada, British Isles, elsewhere.	1	1	1
(2) What protection do patents offer us?	2	2	2
(3) Is a working model available?	3	3	3
(4) Can we buy patents outright?	4	4	4
(5) If product to be made under licensing arrangement:	5	5	5
(a) Are licensing conditions satisfactory?	(a)	(a)	(a)
(b) Are royalties low enough to permit competitive sales and profit?	(b)	(b)	(b)

set to work on his planning with a firm foundation and if necessary elaborate on the list to suit the ramifications of the individual problem.

It should be interesting to note that the check list as reproduced with this article contains the essential highlights needed to check not only the product but also the shop facilities, the markets, the competition, servicing and distribution headaches which may or may not be involved. On such a basis, planning for the future can be made sound and accurate to an amazing degree.

To further clarify the purpose and advantages of the check list for planning, it is interesting to examine the typical list shown in Table I. It can serve as a typical list for a plant's planning as it touches upon all of the fundamentals, and the owner can increase its value by adding to it the specific sub-questions which are peculiar to one's problems as each main point is covered in the check list.

To begin with, presume that a designer has brought a company an idea for a potential postwar product or a redesign of a former product. The first consideration is that of patent rights and the main facts concerning such rights are questioned, as shown in Table I. If this is a first precursory examination of the idea, it may suffice to merely check in one of the three right-hand columns the response to the questions asked. The sum total of the check marks will indicate the patent security and desirability attainable. By weighting the importance of each of these questions by assigning each question a factor of say from 1 to 10, the mathematical total will give a fairly accurate picture of the situation. If either of the above methods seems to indicate a favorable situation, each of the questions can be studied exhaustively and a complete and full answer determined.

This is given as an example of how the check list can be used to arrive at anything from an indication of an answer to the full answer. However, in making a rough check of a product before giving any serious consideration, it is generally better to check each division of the questions roughly first and then decide upon greater consideration or not, as a result of the initial investigation. (See Table II.)

It will be noted that the list in Table II covers the broad classifications of patents, engineering and manufacturing facilities, markets, sales and advertising, and servicing. To give serious consideration to the patent rights before also roughly checking suitability to engineering and production facilities, sales out-

Table II

Engineering and Manufacturing

	Factor Favorable to Our Making Product	Factor Unfavorable to Our Making Product	Need More Information to Decide
(6) Is product suitable for our manufacturing facilities and skill?	6	6	6
(7) What is our position compared to competitors in this field? (a) Labor rate (b) Availability of skilled labor (c) Power rate (d) Manufacturing facilities and equipment (e) Administrative and factory overhead (f) Proximity to materials supply.	7 (a) (b) (c) (d) (e) (f)	7 (a) (b) (c) (d) (e) (f)	7 (a) (b) (c) (d) (e) (f)
(8) Do we have the "know how" to engineer and make this product? If not, are competent men available?	8	8	8
(9) Can we obtain several competitive makes or similar products for our engineers and production men to study?	9	9	9
(10) Will this product be better, or cheaper or both to manufacture, than competitive makes?	10	10	10
(11) What will be the manufacturing cost of the product for an assumed volume output?	11	11	11
(12) To produce this volume, what part of our plant capacity will be required?	12	12	12
(13) How does the manufacturing cost of this product compare with other products sold by our company? Particularly, relation of total direct labor and material to selling price?	13	13	13
(14) How many types or sizes must we make to have a competitive line?	14	14	14
(15) Does the product offer a future market for replacement parts or supplies?	15	15	15
(16) Does this product require engineering for each installation? What will be the cost and personnel required?	16	16	16
(17) How much of an investment will be involved and how much time required for: (a) Technical Survey.....$ (b) Experimental Work.....$ (c) Engineering Development..$ (d) Industrial Design.....$ (e) Preliminary Models.....$ (f) Process Engineering.....$ (g) Tooling for Production.....$ (h) Machinery and Equipment.$ (i) Samples and Testing.....$	17	17	17
(18) Is our organization capable of designing an outstanding product (appearance and mechanical) so that we will be assured a satisfactory volume even though the field becomes sharply competitive? Or would it be advisable to use the services of an experienced and successful design organization?	18	18	18
(19) What percentage of product will have to be purchased from outside sources?	19	19	19

Markets

(20) Has a technical survey been made to gather complete use and user data on this product?	20	20	20
(21) If not, is our organization qualified to make such a study, or should we use the services of a group experienced and successful in making technical surveys?	21	21	21
(22) Has a market survey been made on this product?	22	22	22
(23) Is a sample available for the purpose of obtaining prospective customer reactions at the time of conducting market survey?	23	23	23
(24) What is the extent of the market—sectional national, export?	24	24	24

Table II—Continued

	Factor Favorable to Our Making Product	Factor Unfavorable to Our Making Product	Need More Information to Decide
(25) Is our plant so located that we can serve the major markets for this product without excessive transportation costs?	25	25	25
(26) What was the 1941 total sales of this or similar products and how many companies divided this volume?	26	26	26
(27) What is the estimated average annual market for this product for the first 5 years postwar?	27	27	27
(28) Can we develop other uses and users for this product? What will this volume amount to?	28	28	28
(29) Approximately what selling price will assure us of a satisfactory and profitable volume?	29	29	29
(30) Do competitors have such a strong hold on this market that we will have great difficulty breaking in?	30	30	30
(31) Will there be a large volume of government surplus equipment that may interfere with profitable sale of this product?	31	31	31
(32) Is the market saturated as a result of war production?	32	32	32
(33) How will the disposition of DPC. plants and equipment affect the competitive situation on this product?	33	33	33
Sales and Advertising			
(34) Is this product—	34	34	34
(a) Highly Competitive? Average Price? High Quality?	(a)	(a)	(a)
(b) Continuous? Seasonal? What Months?	(b)	(b)	(b)
(35) What is the sales opportunity for the product under consideration—does a demand exist; can a demand be created at reasonable cost; does product have strong sales appeal?	35	35	35
(36) Can our present organization handle sales?	36	36	36
(37) If not, what kind of sales set-up will be required?	37	37	37
(38) Should we handle sales or make an arrangement with another company which has both the experience and organization?	38	38	38
(39) What is the estimated expense-to-sales ratio based on our own or other companies' experiences? (Including both selling and advertising costs.)	39	39	39
(40) What kind of distribution set-up will be required?	40	40	40
(41) Can our present organization handle advertising and sales promotion?	41	41	41
(42) What will be the cost of the advertising and sales promotion required to successfully launch this product?	42	42	42
Service			
(43) To be successful, would this product require warehousing of parts, parts assembly and storage of finished products in different territories?	43	43	43
(44) Does the product require a national servicing organization?	44	44	44
(45) Can our present organization handle installation and service work?	45	45	45
(46) If not, can arrangements be made with some company that has both the experience and organization?	46	46	46

lets or distribution facilities would be useless. Hence, it is suggested that the leading questions in each of these categories be examined roughly. After a product has passed this preliminary testing satisfactorily, more minute research into individual ramifications is warranted.

Little additional discussion is necessary to make this check list a company's right-hand plan-for-planning. The list itself is self-explanatory and while perhaps not 100 per cent complete for every individual purpose, nevertheless represents a keystone for the initial product and facilitates investigation. Since many of the same problems confront the possibilities for the redesigned peacetime product, the check list is adaptable to whichever product situation may exist.

For large organizations which can afford integral planning departments this can provide a basis for a work sheet which may be applied to every product proposal making its appearance. It should prove of particular value to smaller concerns where the bulk of the planning falls to the lot of a group of busy executives who have at one time the worries of war production plus the burden of postwar survival for their plants. For them in particular the list presents a design for postwar planning which will at least start the research off in the right direction. For the involved problems of the check list which require actual survey work and for design and engineering problems for which plant manpower is not available, competent outside assistance is always available.

Lucite Tank Lining

RESISTANCE of Lucite methyl methacrylate resin to attack by acids is the basis for a new use of the plastic as the lining for 28,000-gal. tanks holding chromic and sulfuric acid anodizing solutions in the treatment of aluminum alloy aircraft parts.

Sheets of Du Pont Lucite are used to line the huge tanks in which the aluminum parts are given surface oxidizing treatment at the Curtiss-Wright Corp. plant, Columbus, Ohio. Use of the plastic has extended the life of the tanks indefinitely.

Plant officials have found the plastic less expensive, lighter, less subject to breakage and easier and safer to handle than the material which it replaced. The linings were installed as the result of the company's experience with Lucite tubes as the insulation for parts exposed to the electrolytic action of the acid baths.

. . . Safe Practices in W

BY ARTHUR C. STERN and CHARLES B. FORD

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THE recent increase in the occurrence of fires, explosions and occupational disabilities in the production of magnesium alloys is chiefly due to the tremendous expansion in the production of these alloys for implements of war. The importance of magnesium to our war program is well shown by current production figures of 530,000,000 lb. per year as contrasted with an annual output of only 6,000,000 lb. in 1939. The purpose of this article is to review the occupational hazards common to magnesium fabrication and to summarize the various safe practice measures necessary for their control.

Magnesium is a silvery white metal characterized by extreme lightness, having a specific gravity of 1.74. Its melting point is 1204 deg. F. Magnesium ignites and burns with an intense white flame when heated in air to temperatures of incipient fusion. It is used industrially chiefly in the form of alloys with aluminum and zinc in which the magnesium content ranges from 89 to 98 per cent.

With regard to fire hazard, these alloys are safe except when the metal is molten, overheated or in a finely divided form. When molten, the metal will oxidize readily and become ignited unless air is excluded from the surface by a proper flux. When the alloys are heated to incipient fusion, in the absence of a protective atmosphere, the metal will also burn. This latter condition will exist during the heat treatment of magnesium alloys, if critical temperatures are exceeded.

Finely divided magnesium alloy dust is a serious fire menace and if moistened with water it becomes even more dangerous. This is due to the fact that it reacts with water to produce hydrogen and magnesium hydroxide, the water supplying the oxygen necessary for combustion. The hydrogen generated introduces the additional hazard of a flammable and explosive gas.

Magnesium Fires

The greatest hazard in magnesium foundries is fire and explosion. Unfortunately the seriousness of this hazard is often not well recognized, particularly by smaller fabricators, and as a result, violent fires and explosions occur with their attendant casualty lists, property damage and loss of production.

At the outset let us examine the record of a few typical fires and explosions in magnesium and magnesium alloy plants in order that we may appreciate more fully some of the disastrous consequences caused by insufficient knowledge of the prevention and methods for extinguishing of magnesium fires.

Germany, 1939—Molten magnesium alloy was being manually transported in a crucible by four workers, one of whom was new to the job, when the latter lost his grip and the crucible upset. The molten metal flowed onto the floor and burst into flame, trapping the workers in one corner of the small, single-exit melting room. The flames ignited the workers' clothing and burned them so badly that two died on the same day.

Unsafe practices in this instance include (1) crowding and lack of sufficient escape exits, (2) employment of a "green" worker on a hazardous job and (3) failure to provide adequate fire retardant clothing.

Hounslow, England, 1940—A fire which started in a storage shed containing 15 tons of magnesium scrap spread to several other wooden sheds and a brick building containing over 200 tons of aluminum scrap. This fire was spread by explosive reactions caused by playing more than 20 hose streams on the burning magnesium and aluminum. It burned for over 48 hr. Two nearby buildings were destroyed by the explosions. Apparently the danger of using water on magnesium fires was not realized by the local fire brigade. Fourteen members of the brigade were injured.

Unsafe practices here include inadequate storage facilities and insufficient knowledge of proper methods for extinguishing the magnesium fires.

Little Falls, N. J., June, 1939—Magnesium alloy castings became ignited in an electrically heated, circulating atmosphere, heat-treating furnace. No one knew how to control the fire, so the village fire department was called. According to the report, the furnace doors were opened and a water hose stream thrown on the burning castings within the oven. Further details are lacking except that the property loss was $50,000, indicating that many things happened when water from the hose stream came in contact with the flaming magnesium castings.

Unsafe practices in this instance apparently include lack of means for extinguishing magnesium fire near oven and insufficient knowledge of extinguishing magnesium fires.

Cleveland, December, 1940—During the weekly inspection of equipment in a magnesium powder plant, a mechanic moved a reciprocating feed mechanism by hand while trying to locate the source of a squeak. The travel of the mechanism probably exceeded normal, causing the moving part to strike a stationary section and produce a mechanical spark. Two men were badly burned by the resulting explosion, although property damage was only $600, since the force of the explosion was vented by explosion-venting panels and windows.

Unsafe practices include failure to remove all flammable or explosive dust from machines and their surroundings before adjustment or repairs were made and failure to construct machine parts of non-sparking metal.

New York, January, 1944—Magnesium alloy castings were being ground in a foundry on a number of grinding wheels which were exhausted by a central, dry type, dust collection system. The elements of this system included long dry ducts, exhaust fans, a cyclone separator and a dust hopper. One of the fans had ferrous blades. During the operation of the grinding wheels the dry, magnesium dust in the collection system became ignited and caused an explosion in the cyclone. The blast ruptured ducts

Working Magnesium

. . . Approved safe practice recommendations for the prevention and control of fire and explosion hazards in magnesium alloy fabrication plants are reviewed by the authors. Occupational health hazards that may exist in magnesium foundries from the presence of atmospheric contaminants such as fluorides, sulphur dioxide, carbon tetrachloride and chromium compounds are also pointed out.

and the dust hopper and sprayed an intensely hot flame over a group of workmen at benches near the hopper. One man was fatally burned and 10 others received burns of varying degrees from the explosion.

Unsafe practices include use of dry dust system for collection of magnesium dust, and lack of adequate fire-retardant clothing for the workers.

These few examples illustrate the effects of the reactivity and incompatibility of water with molten or burning magnesium and the ease with which finely divided magnesium dust can be ignited. Although at ordinary temperatures the reaction of magnesium with water is slight, it increases rapidly as the temperature increases and the accompanying evolution of hydrogen gas increases correspondingly. Since hydrogen is a highly flammable gas it serves to intensify the explosive reactions taking place when water comes in contact with burning magnesium.

Now that magnesium alloys are being processed on a large scale, fire and explosions are being reported more frequently, so it is timely to summarize the various existing safe practice recommendations and to add such new ones as appear reasonable. If these precautions are known and followed, the hazards peculiar to magnesium alloy processing may be largely controlled or eliminated.

Foundry Precautions

As a general precaution covering all magnesium handling, the local fire department should be informed of the fact that the plant is handling magnesium so that they will be warned in advance against using water for extinguishing fires therein. In addition, the outside of the building should bear conspicuous signs warning against the use of water to extinguish fires. The effectiveness of the first precaution in forestalling what might have led to a disastrous fire was illustrated recently in an upstate war plant in a fire involving nine steel drums of magnesium scrap stored in the rear of the plant. Unlike the English firemen, previously mentioned, the city firemen who fought this fire knew that playing water on the burning magnesium would have intensified the blaze and that the resulting secondary explosions might have fired the factory itself. Instead they followed the latest approved technique and brought the flames under control with negligible property loss and no injuries. The technique employed was the use of an approved extinguishing powder kept on hand at the plant.

Throughout those parts of the premises where magnesium is handled, warning signs and posters should be generously displayed, warning against unsafe fire fighting methods, while teaching safe methods. All machines and ovens used for processing magnesium, the use of which would be dangerous for any other metal, should be prominently labeled *"For Magnesium Only."* Conversely, in an area or room in which magnesium is processed, machines or ovens which do not conform to safe practice recommendations for magnesium but which might be used for it by some workmen by mistake should be conspicuously labeled *"Do Not Use for Magnesium."*

Structural Requirements

The melting and pouring of sand castings should preferably be done in one-story, non-combustible buildings only. Melting and pouring into permanent molds or dies should be done on only the street floor of buildings. Because of the reaction between water and magnesium dust or molten metal the buildings used for foundries or die-casting plants should not be equipped with automatic sprinklers.

The walls, ceilings and floors of these plants should be as free as possible of ledges, rafters or other places where magnesium-containing dust may find lodgment. The ceilings of the rooms should be high enough so that burning vapors will not reach the ceiling and spread the fire. Combustible ceilings are dangerous, especially when low. If necessary, wooden roof planks should be replaced with non-combustible material, or at least the underside should be sheathed with asbestos millboard or cement plaster.

Floors in the vicinity of melting units and aisles or gangways used for the transport of molten metal should preferably be paved with hard burned or vitreous paving brick. The width of gangways and aisles in magnesium foundries should not be less than is required in other types of foundries and should preferably be wider because of the greater hazard involved should anyone trip or fall while transporting molten magnesium. Rooms in which magnesium is melted or poured should have not less than two means of exit so located that in the event of fire or explosion blocking one exit, the other will be usable. These precautions are especially important with regard to the area in the immediate vicinity of the melting pots or furnaces.

Melting Magnesium Alloys

Magnesium alloys are usually melted in cast or wrought steel crucibles placed in a brick setting and fired by gas or oil. Chloride and fluoride containing fluxes and sulphur are used to exclude air and prevent the molten metal from taking fire. These are sprinkled on the molten metal as needed to maintain a continuous shield. Hazards will be present here if the metal is melted without flux protection, if a crucible fails allowing the molten metal to run into the furnace setting, or if wet or dirty metal is introduced into the crucible.

Only refractories which are inert to molten magnesium should be used in building the setting in which the melting pot is to be heated. The use of materials containing sodium silicate for furnace lining or repairing, for example, should be avoided. The setting should be easily accessible for cleaning and should be cleaned daily of iron oxide crucible scale. If molten

magnesium from a leaking crucible comes in contact with hot iron oxide, a violent reaction of the thermit type may result, causing explosions which scatter the molten metal.

The setting of melting pots and crucibles should preferably be so designed that any metal running into it from pot failure will immediately flow out again into a prepared, dry, run-off container. This will minimize the amount of burning within the setting, avoid damage to the brickwork and permit the fire to be extinguished more easily. The latter may be accomplished by covering the burning metal with melting flux, a special extinguisher such as a graphite powder-organic liquid compound or any other approved compound.

Where furnace settings are so poorly designed that the molten magnesium stays in the settings and burns, the fire can be extinguished either by throwing regular melting flux into the setting; or preferably, by the application of a graphite powder-organic liquid compound by means of a special portable pump.

A set of valves controlling the fuel and air supply to each pot setting should be installed so that they may be shut off at any time without the necessity of going near the setting. These valves should be of the quick acting type, located not less than 25 ft. from the furnace and conspicuously labeled.

Crucible and Ladles

Crucible furnaces should be so constructed that the crucibles heat uniformly, preferably by radiant heat, without local flame impingement or overheating. Crucibles should preferably be provided with a protective coating of aluminum to reduce the formation of dangerous iron oxide scale. Another method of reducing oxidation of the outside of the crucible is by controlling the fuel-air mixture so that excess oxygen is kept at a minimum. Crucibles should be cleaned of scale after each melt and carefully inspected for weak spots at least once a week. This inspection should consist of hammering and calipering the crucible and discarding any crucible with thin spots.

Inasmuch as magnesium alloy fluxes are hygroscopic at room temperature, ladles and skimmers used on the molten metal usually collect moisture when not in use. If this moisture is allowed to get into the molten flux or metal, a serious explosion may result. Therefore, all these tools should be preheated before being introduced into the molten metal.

The use of a rigid frame to support the ladle to prevent accidental tipping when molten magnesium is being poured into it is also recommended.

Pouring

Special oxidation inhibitors such as boric acid, sulphur, borax or soluble fluoride salts when added to the molding sands, make it possible to pour molten magnesium alloys into damp sand molds with no attendant reactions. However, since there is always the possibility of excessive moisture or other dangerous foreign material entering the finished molds through sprues and risers, it is highly important that the molds on the foundry floor be kept covered until ready for pouring. Failure to observe these precautions may result in violent burning and exploding of the metal in the mold.

The area in which pouring is done as well as the space around any melting pot should be checked repeatedly for the presence of any tripping hazards.

Furnace tenders and members of the pouring crews should be provided with and should wear leather gloves (preferably not of the gauntlet type), leather jackets, leather pants or chaps, having shoe flares and instep straps, non-combustible, transparent, plastic face shields and molders' safety shoes. Wearing of woolen, silk or fuzzy outer clothing, particularly sweaters, in the melting or pouring room should be prohibited. Exposed fabric outergarments should be treated with fireproofing chemicals after every laundering.

If a location can be selected which is safe with respect to proximity to molten magnesium, the installation of one or more deluge showers is recommended. Such showers are more effective than fire blankets for extinguishing clothing fires.

Abrasive Blasting

The fire hazard associated with the abrasive blasting process appears to depend upon whether the abrasive used is sand or metallic shot. Apparently, when sand is used as the abrasive, the resulting dust contains such a high percentage of sand and so low a percentage of magnesium dust as to be essentially noncombustible and nonexplosive. Therefore, this dust may be treated the same as that from ordinary ferrous or non-ferrous blasting operations.

However, when the blasting is done with metallic shot or grit, the magnesium content of the resulting dust is likely to be higher than when sand is the abrasive. In this case, in addition to the use of a standard blasting enclosure, the following precautions should be observed: (1) Only wet dust collectors should be used; (2) the branches and mains from the blasting equipment to the wet collector should have no obstruction, dead end spaces or pockets in which dust might accumulate, and (3) this ductwork should be provided with explosion relief, inspection and cleanout doors on the top side of the branch or main at centers not more than 20 ft. apart.

Heat Treating Operations

The heat treatment of magnesium alloy castings may also introduce a fire hazard if the temperature of the furnace atmosphere exceeds the maximum allowable limits set for the alloys. Circulating atmosphere, gas-fired or electric furnaces are used for heat treating operations. For the usual alloys the heat treating temperatures range from 730-780 deg. F. When these temperatures are exceeded, either through local or general overheating, oxidation proceeds and the surface of the castings may take fire. Should this burning continue, sufficient heat may be generated to melt the castings, resulting in free and rapid burning of the whole mass of metal. Since the latter condition usually results in a dangerous and highly destructive fire, effective measures for preventing and controlling the condition should be understood and practiced.

Recommended safe practices for the prevention of heat-treating fires include:

1. Provide an atmosphere of 0.7 to 1.0 per cent of sulphur dioxide in the furnace to inhibit surface oxidation of the metal and prevent fires from starting.

2. Build furnaces as airtight as possible to enable effective smothering of fires should they occur.

3. Before placing castings in furnaces be sure they are free from grindings and sawings which would be apt to ignite in the furnace.

4. The furnace should be kept free and clean of scale in order to avoid intensifying the fire should the scale come in contact with burning magnesium.

5. Automatic oven temperature regulating and control equipment should be an integral part of each oven to prevent overheating. It should be set to maintain a uniform oven temperature, preferably less than 800 deg. F., and should cut off both the circulating fans and the heat supply to the oven when the oven temperature exceeds 800 deg. F.

6. A manual means should be provided for shutting off circulating fans and heat supply, operated from a point not less than 15 ft. from the oven.

While sulphur dioxide is used to provide a protective, oxidation-inhib-

iting atmosphere in heat-treating furnaces, it is not effective as an extinguisher of magnesium alloy metal if the latter takes fire. On the contrary, it will react violently with the free burning metal and therefore other means must be provided to control and extinguish such fires when they occur.

The extinguisher considered best for the control of fires in heat-treating furnaces is a graphite powder-organic liquid compound which is handled in a special extinguisher pump developed by the St. Regis Paper Co., Oswego, N. Y. In applying this compound the furnace door is opened and the fire fighter directs a stream of the extinguisher directly on the burning castings.

Finishing Operations

Casting finishing operations such as sawing, machining, rotary filing and grinding all produce chips or particles of magnesium which will take fire under certain conditions. Since the potential danger varies inversely as the size of the particles, the fire hazard associated with the first three named operations is nowhere near as great as that presented by the fine, explosive dusts generated in grinding operations. Nevertheless, there is a definite fire hazard at any operation where magnesium cuttings are produced unless they are properly controlled and disposed of. Control of these particles at their point of production by means of local exhaust systems, while not absolutely necessary, are a great help in preventing their accumulation around machines and in the workroom.

The observance of good housekeeping practice has been found most effective for the control of the hazard from coarse magnesium particles. Machines should at all times be kept free of accumulations of cuttings, sufficient to create a hazard. The floors around the chip producing machines should be swept frequently by janitors who place the cuttings in special covered metal containers designated for magnesium only. It is also recommended that this good housekeeping practice include the regular and frequent cleaning of all roof trusses, pipes, window sills or any other places in the workroom where magnesium dust might lodge. This cleaning should be done with a dry, soft brush.

Machining and Filing

The usual machine shop operations are employed for rough finishing magnesium castings. These include turning, shaping, drilling and filing. Band saws are also used for the removal of gates, sprues and risers. Rotary filing is used to remove burrs and for smoothing the casting generally. These operations usually produce fine chips or turnings which can become ignited by either frictional heat or sparks generated by improper machining practice or spark-producing foreign inclusion in the metal being cut, or flames and sparks from an outside source, such as smoking, welding or electrical shorts.

In order to control the inherent fire hazard for these operations the following safe practices should be observed:

1. Cutting tools must be kept very sharp and ground with adequate clearance behind the cutting edge.

2. The tool should be in contact with the work only when cutting is actually being done; it should be backed away as soon as the cut is finished.

3. As heavy cuts as are practicable should be taken.

4. It is preferable that no coolant be used other than air. If coolants are required use only neutral, high flash, mineral oils. Water soluble oils or other water base coolants should not be used because of the reaction between water and finely divided magnesium.

5. Finely divided metal should not be allowed to accumulate on or under the machines. Where practicable a shallow metal pan should be placed under the machine to catch the cuttings and the scraps should be brushed off the machine and into the pan at frequent intervals. Accumulation of cuttings in the pan should be avoided by frequent and periodic emptying of the pans into dry, plainly labelled, covered iron containers.

6. The floor around each machine must be swept up at least once per shift and the sweepings placed in one of the covered iron containers.

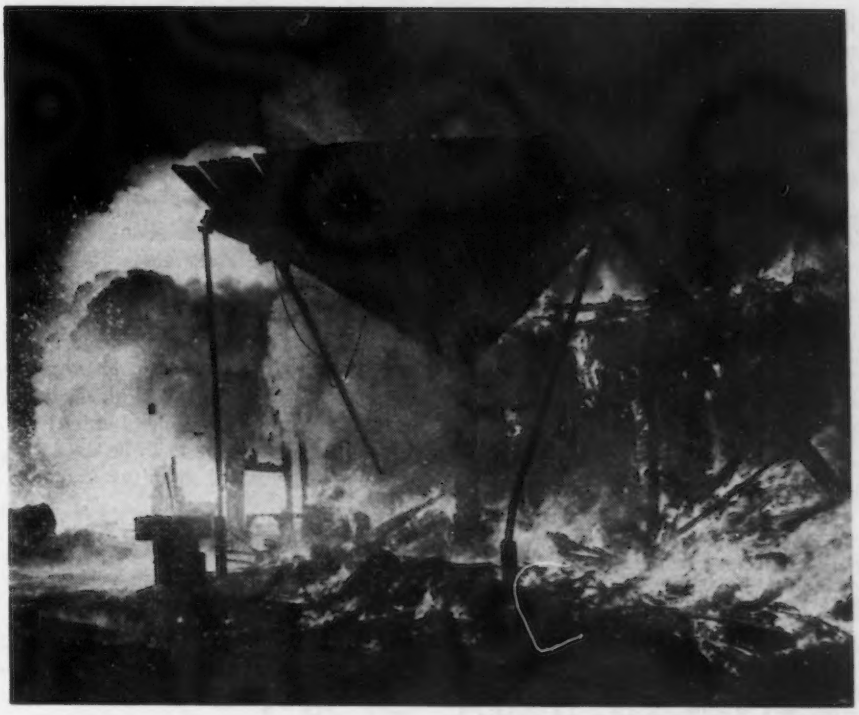
7. Flames and hot sparks must be kept away from finely divided magnesium at all times. Welders and maintenance men should be warned of this danger. Smoking should be prohibited in areas where such metal is present. All electrical equipment which tends to create arcs or sparks should be of a type approved for use in explosive atmospheres.

8. Each work place should be provided with an adequate supply of approved magnesium fire extinguisher to be instantly available in case of fire. The proper application of the material should be demonstrated to all operators.

9. Large amounts of metal cuttings should not be allowed to accumulate in the machine shop. Containers of cuttings should be removed each day to a plainly marked, dry non-combustible building preferably located away from the main buildings. A sufficient supply of approved magnesium fire extinguisher should be located at the scrap storage building. Caution is also directed against the storage therein of excessive amounts of scrap. This material should preferably be returned to the reclamation plant as soon as possible. Scrap recovery is a specialized process which should not be attempted without detailed instructions from magnesium alloy manufacturers.

Grinding and Polishing

Grinding and polishing of magnesium alloys may be conducted either



PYROTECHNICS of a magnesium foundry fire. Playing water on a fire of this kind only adds to the conflagration.

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wet or dry although with usual magnesium practice these are dry operations. However, when wet grinding is desired, the same precautions must be observed as were specified for the use of coolants in machining operations, that is, only neutral, high flash point mineral oils should be permitted as lubricants or coolants and sufficient oil must be used to drench the dust produced and effect complete removal to a sludge-collecting tank. No animal, vegetable or acid-containing mineral oils and no oil-water emulsions or other water base coolants should be permitted for this operation.

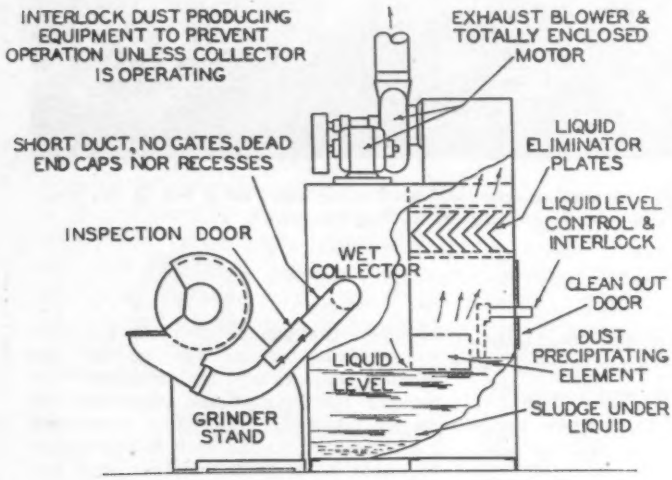
The dust sludge should be kept thoroughly wetted with oil to reduce the fire hazard and the sludge tanks should be cleaned out frequently to prevent large accumulations of magnesium dust. Approved methods for the disposal of this sludge will be discussed later on.

Dry grinding and polishing of magnesium alloys produces highly flammable dust which can ignite with explosive violence when present in the proper proportion with air. Attempts to collect this dust in the conventional dry type of dust collector wherein dust is exhausted through long dry ducts and dry-type collectors have been fraught with disastrous consequences from fire, explosion and fatal injury. One such case was cited at the beginning of this paper. Because of this hazard, dry-type exhaust systems must never be used for the collection of magnesium dust from grinding operations.

The only systems considered safe for the exhaust and collection of magnesium grindings are those employing the wet-quenching principle in which the dust is precipitated as a sludge by a heavy spray of either water or low viscosity mineral oil. This is the one instance in the control of flammable magnesium dust where the use of water is permitted. This exception is based on the established fact that magnesium dust which contains over 50 per cent water by weight cannot be ignited.

Wet Dust Collector

A good wet collector should exhaust the dust immediately from the point of origin, precipitate it thoroughly in the liquid medium, and maintain the magnesium sludge in a non-flammable, non-explosive condition until it is finally disposed of. The design details of the collector depend chiefly on whether the collector is to be used for exhausting pedestal grinding and polishing wheels or for portable wheels which would ordinarily be used at a bench. In the first case the grinding wheels have permanent hoods which are connected to the collector by ducts; whereas in the second case the collector itself is in effect a booth where the work is supported on a grating. In either case the air stream through the hood or grating conveys the dust particles through the liquid spray where the dust is precipitated and collected as sludge under the head of the liquid precipitant.



TYPICAL liquid precipitation type of separator recommended for handling magnesium dust exhausted from a grinder stand. (From National Fire Protection Assoc. Code.)

Good design details require that the dust ducts between the grinding wheels and precipitation unit be as short and as straight as it is possible to make them, have a minimum number of bends, and be of constant area throughout the branch up to and including its connection to the collector. The regular operation of the collector should keep the ducts substantially free of dust. This is to eliminate the possibility of the dry dust accumulating in quantities sufficient to create a hazard. The dust, after quenching, should be kept under a head of liquid until removed for final disposal. The collector unit should also be interlocked with the grinder so that the latter cannot operate unless the precipitating and air moving elements of the collector are in operation. Not more than two branches (or three branches if one is from an auxiliary downdraft grille) should connect to any one wet dust collector. Each branch should be provided with a means for explosion pressure relief, inspection and cleaning. Branch air velocities in excess of 4500 ft. per min. are recommended.

Sludge pits and tanks should be adequately ventilated to remove the hydrogen formed when water is used as the precipitant. The collected sludge should be removed from the pits at frequent intervals.

Grinding Safe Practices

The following precautions should also be observed in order to fully safeguard grinding and polishing operations:

1. Workmen engaged in grinding and polishing should wear protective clothing made of leather or smooth fire-retardant canvas, denim or similar fabric of close texture. These garments should be made without pockets or cuffs in which magnesium dust might lodge; they should have non-ferrous fasteners and be so made as to permit speedy removal if necessary. Dust which settles on clothing should be brushed off frequently. The wearing of woolen, silk or fuzzy outer clothing, particularly sweaters, or shoes with exposed steel parts should not be permitted. Fire retardant fabric garments should be laundered at least once a week and re-treated with the fireproofing chemicals after each laundering.

2. Goggles should be provided all grinding and polishing wheel operators for adequate eye protection and should be worn.

3. Iron, steel or other sparking materials must not be ground on machines used for magnesium alloys. To guard against this unsafe practice magnesium grinding equipment should be plainly labeled "For Magnesium Only."

4. The dressing, roughing or trueing up of abrasive wheels by means of a tool capable of causing sparks is to be avoided.

5. Machines, workbenches, floors, wall ledges, pipes, roof trusses or other places where magnesium dust might collect should be cleaned frequently to avoid the accumulation of dangerous amounts of dust. Dust on floors and other immediate working areas should be cleaned at least daily or more often if necessary. Overhead ledges should be cleaned as often as periodic inspection indicates desirable. Portable vacuum cleaners should not be used to collect the dust nor should a central vacuum cleaning system be used unless specifically

designed and approved for handling magnesium dust. The dust should be collected by sweeping up with dry, soft brushes and non-sparking scoops and placed in plainly marked, covered iron containers. This dust should then be disposed by either burning on a dump or by burying after mixing with five parts of sand.

6. The safe practice prohibiting flames or hot sparks from the vicinity of machining scrap should be even more rigidly enforced in the vicinity of grinding dust because of the inherently greater hazard. Electric motors, control equipment wiring and lighting attached to or near magnesium grinding equipment should be of approved explosion-proof types and all equipment should be securely and effectively grounded to prevent the accumulation of static electricity. Prior to repair, all equipment in the grinding area should be thoroughly cleaned of magnesium dust and all tools and fixtures used for repairs or maintenance should be of non-sparking construction. Heavy dust accumulations in ducts, booths, and dust collectors may be wet before removal by spraying with light mineral oil.

7. An adequate supply of approved magnesium fire extinguishing compound should be immediately available at each grinding booth.

Dust Disposal

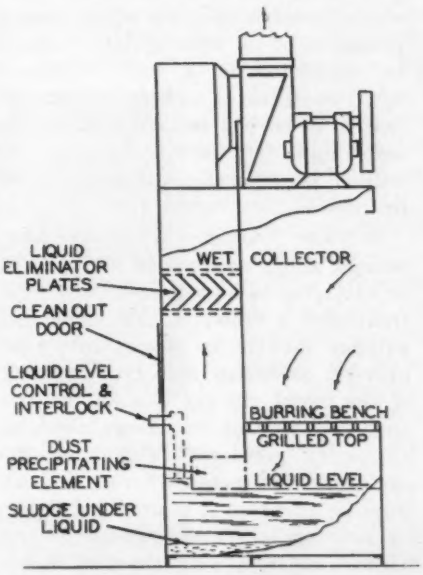
The dust sludge in the aqueous collectors can become a dangerous fire and explosion hazard if allowed to accumulate in the sludge tank in a damp rather than flooded condition. In the damp state (less than 50 per cent water) the reaction between finely divided magnesium and water might generate sufficient heat to spontaneously ignite the hydrogen evolved and the metal dust. It is therefore essential that the wet sludge be removed from the collectors every day or as often as conditions warrant.

Because of its highly hazardous characteristics of easy ignition and violent combustion no safe method for reclaiming this sludge is known and it must be disposed of as waste. The methods recommended for the disposal of this dust as well as the fine sweepings from the grinding room consist of either burning on a brick hearth laid in the plant yard or mixing with five parts of sand and burying in a dump. Where the amount of sludge disposed of daily amounts to several cubic yards or more, the preferred method of disposal is by burning since fires and gas explosions have occurred in dumps where large quantities were buried.

Covered metal containers, preferably of not over 50 lb. capacity each, should be used for transporting the dust and sludge from the plant to the burning or burying areas. Sludge containers should have vented covers to allow release of the hydrogen generated.

A recommended type of sludge-burning hearth consists of a layer of firebrick laid on sloping earthwork for good drainage. This burning station should be located a safe distance from buildings or other combustibles.

Because of the dangerous fire hazard, only capable and well-trained employees should be assigned the task of burning waste magnesium dusts. Obviously such workmen should wear adequate fire retardant clothing.



ANOTHER approved type of wet dust collector used in exhausting a bench on which magnesium castings are finished with portable grinding tools. (From N.F.P.A. Code.)

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Extinguishing Magnesium Fires

A knowledge of the fire fighting methods recommended for magnesium is essential to the attainment of safety in magnesium foundries because fires may occur despite rigid control of the molten or finely divided metal. Until recently, considerable confusion and misinformation existed in the minds of many concerned with this problem. Fortunately, this confusion has been clarified and standard materials and procedures have been developed by the leading magnesium producers and manufacturers of fire extinguishers which have been tested and approved by safety organizations such as the Underwriters Laboratories, Factory Mutual Laboratories and the U. S. Bureau of Mines.

Fire extinguishers for magnesium may be divided into three categories as follows:

1. Conventional extinguishers, which should never be used on burning magnesium.
2. Extinguishers satisfactory for small or incipient magnesium fires.
3. Special proprietary extinguishing compounds approved for general use on magnesium fires.

The conventional fire extinguishing materials such as water, chlorinated hydrocarbons, foam solutions, carbon dioxide gas or powders generating carbon dioxide are not recommended because they either react violently with the burning magnesium or are ineffective. Chlorinated solvents are further undesirable because of the formation of highly toxic phosgene gas by contact of solvent vapor with the burning metal. Other gases such as nitrogen and sulphur dioxide also react with burning magnesium and only serve to intensify the fire.

Small or incipient magnesium fires may be effectively extinguished by blanketing with dry sand, talc, heavy mineral oil, powdered pitch, cast iron borings or similar material. The use of these materials is limited, however, to incipient or small fires, for when most of them are applied to free burning magnesium they usually accelerate and intensify the fire. In the case of sand or talc this is due to their reacting with the burning metal while heavy mineral oils or pitches are themselves flammable if heated to their ignition temperatures. Sand, of course, should never be used in machine shops where its abrasive action would damage precision machinery.

The special proprietary compounds approved for general use as magnesium fire extinguishers are the most effective of all extinguishers. Foremost among these are compounds of graphite powder and organic liquid whose application by means of a special pump has already been mentioned. Although the detailed instructions of the manufacturer should be followed in using these compounds, the general method to be followed in the case of small fires is simply as follows: Cover the fire with an even layer of compound at least ½ in. deep and leave undisturbed for several minutes. If the fire continues in spots more compound should be added to each spot. The whole mass is then shoveled into an iron container.

Protection of the individual workman is best afforded by training each worker in the proper methods of extinguishing fires both on the premises and on themselves or associates. Deluge showers, properly located and easily operated, should be provided for combating serious injury from clothing fires. The best training program should center around actual demonstrations of how a magnesium fire burns, what happens to the fire

when conventional extinguishers are applied to it, and the proper application of approved extinguishing materials.

Since a certain amount of specialized knowledge is necessary for the control and proper extinguishment of magnesium fires it is also recommended that selected members of each shift be given intensive training as special fire-fighting crews to supplement the regular plant or municipal fire departments.

Other Occupational Hazards

Silica Dust—The engineering control of silica containing dust released in the sand casting of magnesium alloys is essentially the same as in brass or aluminum foundries and has been too well treated elsewhere to warrant repetition here. However, the good housekeeping practice of wetting down the floors of pouring areas advocated for other types of foundries must positively not be followed in magnesium foundries because of the violent reactivity between water and molten magnesium.

Fluorides—Fluorine salts are used as oxidation inhibitors for the molding sand and sand cores. Treatment of the molding sand with these fluoride salts may result in an excessively high fluoride exposure during either sand conditioning, pouring or shake-out operations. The immediate action of inhaled fluorides is one of local irritation to the upper respiratory tract, causing such manifestations as coryza and nosebleeds. The breathing of excessive concentrations over a long period of time may also produce a chronic fluorosis.

Studies made by Williams (Ref. 5) indicate that, in general only the shake-out operations cause an excessive exposure to fluorides. Safe practice demands, therefore, that this operation be locally ventilated by conducting it in an exhausted area or enclosure. More recent studies by Largent and Ferneau (Ref. 9) indicate greater fluorine absorption by men engaged in spraying cores with solutions of fluorides and by pourers than by men who work at shake-out and core knock-out. Control of the core spraying operations may be accomplished by the use of an adequate spray booth and providing the workers with respirators. The pourer may be protected by utilizing an adequately ventilated centralized pouring station or else by sufficient general room ventilation while pouring takes place. General room ventilation is also an important supplement to locally exhausted shake-out stations as a means of ridding the workroom atmosphere of excessive concentrations of fluorides. In any case the maximum allowable fluoride concentration in the worker's breathing zone should not exceed 25 mgm. per 10 cu. m. of air based on an 8-hr. daily exposure which is believed to be the maximum allowable safe limit.

Carbon Tetrachloride — Exposures to carbon tetrachloride may occur where casting chills are sprayed with a suspension of talc, graphite or flint in a carbon tetrachloride solution. As a general rule this operation is of short duration only, but where the exposure is at all appreciable it should be conducted in a well ventilated spray booth so as to keep the concentration of carbon tetrachloride within safe limits. (A limit of 75 parts per million is generally considered good practice in this regard.)

Sulphur Dioxide—Wherever magnesium alloys are melted and poured or subjected to high temperature heat treatment, a protective atmosphere of sulphur dioxide is often utilized to prevent oxidation and free burning of the metal. In the case of melting and pouring this is accomplished by sprinkling powdered sulphur on the surface of the metal, whereas in heat treating furnaces it is provided either by burning powdered sulphur in the furnace or by piping the gas direct from cylinders.

Sulphur dioxide is an irritating gas even in low concentrations but in higher concentrations it may cause systemic disease. This gas should be kept below the concentration at which irritating effects are noticed. The concentration of sulphur dioxide in the foundry atmosphere can be reduced to safe levels by several means: (1) Hooding the melting pots and furnaces; (2) providing local exhaust ventilation at pouring and shake-out areas; (3) proper design of heat-treating furnace, and (4) the addition of general room ventilation to the extent necessary. It is advisable that heat-treating ovens be so designed that no pressure greater than atmospheric will be maintained inside the oven to avoid escape of SO_2 into the workroom.

One or more gas masks, approved for acid gases, should also be available for emergencies where high concentrations of sulphur dioxide may be encountered.

Chromium Compounds—Magnesium alloy castings are frequently given surface treatment by immersion in chrome pickles containing acid and dichromates. The handling of these chromium compounds in both solid and solution form are capable of injurying the skin and mucous membranes unless adequately controlled. For the protection of workers engaged in these operations the following measures are essential:

1. Chrome tanks should be provided with adequate local exhaust ventilation to remove corrosive chrome mists from the breathing zone of the operator.

2. Suitable protective clothing such as rubber gloves, aprons and boots should be worn by the picklers. The use of protective creams and ointments are also valuable adjuncts for skin and tissue protection and the use of petrolatum in the nose is useful in protecting the mucous membranes therein and preventing chrome ulcers.

3. Approved goggles and respirators should be worn by workers who are exposed to chrome dusts.

It is earnestly recommended that all magnesium alloy fabricators, especially the smaller ones, check their plants without delay for the existence of unsafe conditions or practices and that they eliminate them, if found.

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Drop Forgings Produced on Flat Die Hammers

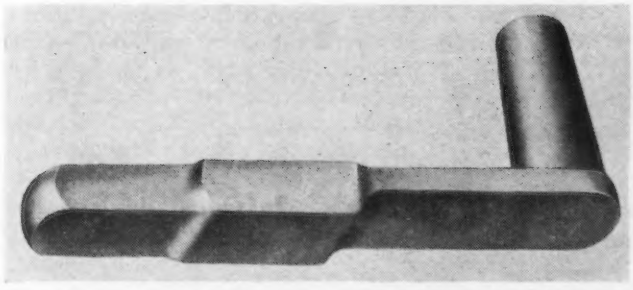


FIG. 1—Finished lever, normally produced as a drop forging, as it was produced by flat die hammer.

FIG. 2—Die for forming handle. Prior to using this die, the billet is bent, corners rounded, and end drawn down. Then the tip is bent and driven into die cavity shown, forming the handle of lever.

HOLDING urgent orders for drop forgings in excess of its available equipment and manpower, Kropp Forge Co., Chicago, found it possible to substitute flat die hammers for drop hammers on many items. Special tools, fixtures and anvil dies were devised for customers who could not wait for drop forging dies and regular drop forgings to be made. All tools, fixtures and dies used in making drop forging substitutes on flat die hammers have been made in Kropp's own shop from designs suggested by the hammersmiths who made the parts, with modifications suggested in some cases by the Kropp engineering staff. Pictured is the production procedure employed in the making of several thousand levers badly needed on an armament job. Waiting for dies and normal production would have involved a delay of 18 to 20 weeks. Flat die production got delivery in six and a half weeks at a cost comparable to normal, and according to Kropp, tolerances were maintained throughout production. Parts from 1 to 50 lb. are being produced by these methods.

The Kropp flat die forging department has found another useful niche in the production of prototypes for aircraft and ordnance forgings. Thus, much time, expense and material are saved on experimental models.

A more usual function of this department is on short production runs in which the number of pieces to be produced is insufficient to justify sinking drop forging dies.

FIG. 3—With handle still in slot, portion of lever adjoining handle is drawn back by sizing tool.

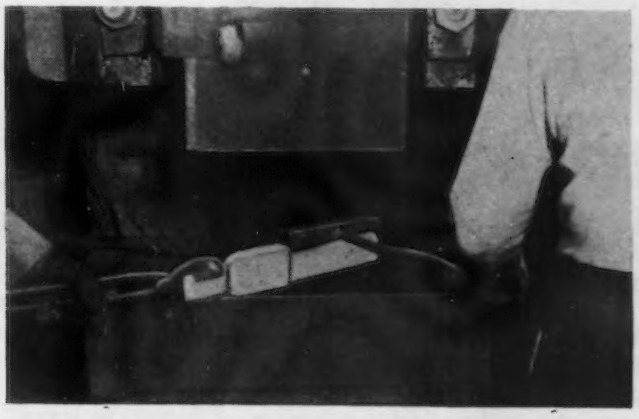


FIG. 5—Side of lever is flattened and contoured; handle extends to rear.

FIG. 4—Flattening tool forms curved contour occurring at right center of lever base. Handle remains in place in central die cavity. Next the edge of handle is trimmed in the same die.

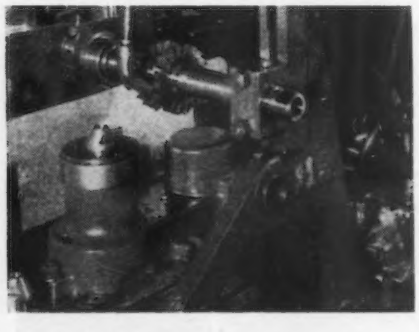
FIG. 6—Both sides of lever are straightened and sized. It is then cut to length.

New Equipment . . .

Small Tools and Gages

. . . New developments in holding fixtures, fastening devices and gages are described in the following pages which are a continuation of the review for June 8.

THE addition of new sizes which now give a collet capacity of up to 1¾ in. to the Redmer air chuck has been announced by the *Redmer Air Devices Corp.*, 601 W. Washington Boulevard, Chicago. These new models use B. & S. type screw machine collets and can be held to center and depth as the collet remains stationary thereby eliminating any possibility of variance due to variations in the diameter of the parts held. These larger chucks have increased holding pressure and it is claimed that operations that exert considerable effort can now



be done by the use of these holding fixtures. The Redmer air chuck is a precision-holding fixture for holding parts for milling, drilling, tapping, threading, assembly, etc., and eliminates in most instances the making of special fixtures.

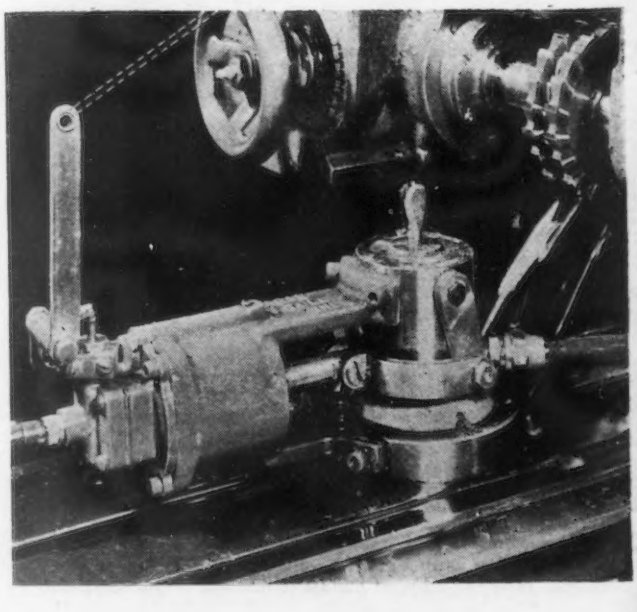
Chuck and Magnetizing Unit

THE new related products—the DoALL electromagnetic chuck and Selectron—are announced by the *Continental Machines, Inc.*, 1301 Washington Avenue South, Minneapolis 4. The Selectron uses electronic power to control the flow of magnetic pull in the chuck and to demagnetize the chuck when the work is to be removed. The variable control of the amount of magnetic current going through the work and the chuck permits accurate grinding of thin flat work which may be warped or bent from heat treatment. The chucks are available in two sizes, the 6x18 in. size at 125 watts and the 8x24 in. at

175 watts. Both chucks can be operated with either 110 or 220 d.c. The Selectron is available in 120 or 220 volt a.c.

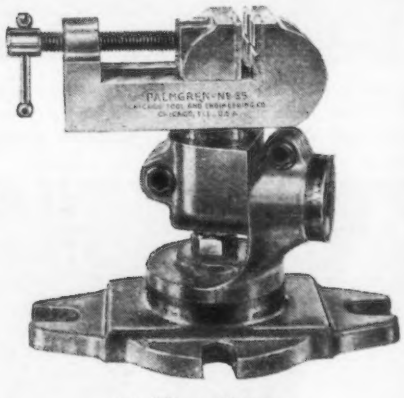
Marking Fluid

IDENTIFICATION marking fluid is being compounded in twelve different distinct colors by the *Dayton Rogers Mfg. Co.*, 2835 12th Avenue South, Minneapolis, for marking sheet strips and bar alloys. It may be used on layout work or inspection departments, in the identification of metal parts. It is brushed on and dries instantly. The material may also be used in marking and identifying various finish hardened ground parts for part number making and other identification. The remover obliterates marks no longer needed.



Grinding Fixture

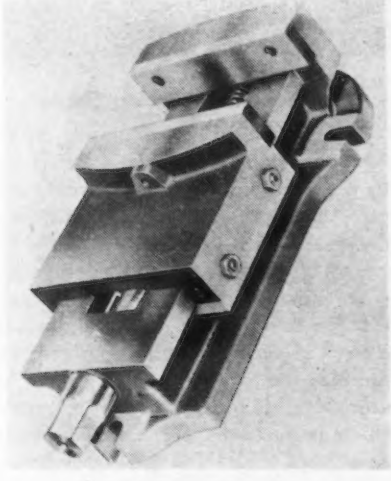
A CHIP breaker grinder fixture for grinding carbide tipped tools, dressing grinding wheels and precision grinding of small parts is produced by *Chicago Tool & Engineering Co.*, 8348 South Chicago Avenue, Chicago 17. The fixture has three full 360 deg. graduated adjustments and provides locking at all angles.



Holding Fixture

AN air-operated holding fixture has been announced by the *Zagar Tool, Inc.*, 23880 Lakeland Boulevard,

Cleveland. The Air-O fixture features the use of air only to actuate the locking and unlocking mechanism, insuring uniform holding power regardless of variations in air pressure. By using a rod or chain, the fixture is readily tied to the cycle of the machine it is used with, whether milling machine, drill press or automatic machine, thus making operation completely automatic. The operator's hands are entirely free to load and unload.



Machine Vise

THE *David J. Ross Co.*, Benton Harbor, Mich., has added four new heavy stationary vises to its line of Rouselle Victory vises. These vises have heavy extra bases and ways with extra-strength locking screws to give the solidity demanded for heavy work requiring precision. Wide clearances have been allowed for the use of wrench and a cleanout hole in the base of the stationary jaw allows chips to be removed easily. These new vises are made in four sizes: 4½, 7, 10, and 13 in.

Thread Roll Snap Gage

A COMPARATOR type thread roll snap gage, Limitrol constructed to gage external diameters up to 1 in., has been announced by *N. A. Woodworth Co.*, Detroit. Limitrol which can be used either as a hand or bench type gage is manufactured with both plain and threaded rolls and is available in both open and closed models. It checks pitch diameter, lead, taper, angle, straightness, and out of roundness. For gaging parts with 0.004 in. tolerance or less, it offers 250:1 magnification and magnification of 150:1 for parts with greater than a 0.004 in. tolerance. Different pitch rollers are interchangeable and one set of rollers may be replaced in less than 5 min.

Limitrol is made in six nominal sizes, ¼, ⅜, ½, ⅝, ¾ and ⅞ in., each being adjustable ⅛ in. either way from the nominal size. Rolls are provided in three widths, ⅜, ⅝, and 1 in.

Synthetic Rubber Bonded Disks

THE Radiac synthetic rubber cutoff disks and grinding wheels are claimed by *A. P. deSanno & Son*, Phoenixville, Pa., to improve wheel and disk quality, uniformity of bond, structure and composition. Wheels and disks are manufactured in the standard range of thicknesses and diameters up to 20 in. They may be used for cutting cold rolled and high speed steels, roller bearing stock, glass rods and tubing and for wet grinding ball bearing races and roller bearings.

Protective Coating for Gages

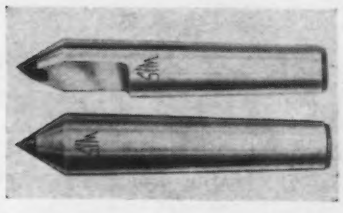
FOR processing steel precision gages for visual control, protection against corrosion, visual inspection of flaws and cracks, and protection against tampering, the *Mitchell-Bradford Chemical Co.*, Bridgeport, Conn., has developed "Black Magic" and "Witch Dip." The gage is blackened in the Black Magic bath to a depth of penetration of approximately 0.0001 in. and given a final coating of Witch Dip wax. When the bright steel again shows through the blackened surface, it may be reblacked and the process continued until the entire tolerance is used up.

Diamond Wheels

THE use of the Zurium bonding process for locking diamonds in the wheel is announced by *Industrial Abrasives, Inc.*, 3724 West 38th Street, Chicago. The Super Cut Zurium bonded wheels are claimed to hold up under tough applications and each wheel is capable of grinding several thousand carbide tools, thus lowering costs.

Carbide Lathe Centers

EXTENSION of the carbide insert into the shank of lathe centers and half centers manufactured by *Wendt-Sonis Co.*, Hannibal, Mo., is designed to provide longer service life. The extension is approximately equal to the exposed portion of the tip, allowing extra regrind before replacement, should the bearing surface of the tip become damaged. The manufacturer guarantees these centers to a concentricity within 0.0002 or less, with the carbide tip providing added wear resistance and consequently improving accuracy. The lathe centers are stocked in standard tapers.



Tube Marking Holder

A HOLDER which eliminates separate handling of each character and permits peripheral marking near the end of tubes rather than marking lengthwise, has been developed by the *M. E. Cunningham Co.*, 101 East Carson Street, Pittsburgh. The holder includes a hand grip lock and a pointed screw which holds the unit in position for marking. It is made available with any necessary number of characters, which are made of Cunningham safety steel.

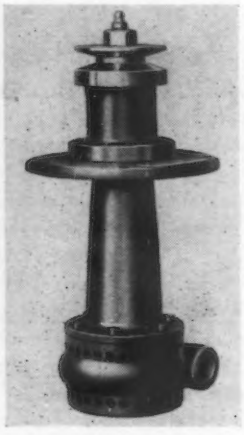
Precision Measuring Instrument

FOR precision measuring the torsion of small spiral springs, the *Sheffield Corp.*, Dayton, as a result of

collaboration with the Gruen Watch Co. and Manross Div. of the Associated Spring Corp., is now producing a new instrument, the Torsiometer. The Torsiometer will accommodate springs up to 2⅞ in. in diameter with a maximum torsion measurement of 49.5 mm. grams, which is practically sufficient capacity to cover the complete range of springs used in most instruments. The indicator spindle of the Torsiometer rides on a jewel bearing and has a resistance of nearly zero. The pointer is made of nonmagnetic material and the pointer assembly is statically balanced.

Coolant Pump

A BELT driven Gusher coolant pump has been placed on the market by the *Ruthman Machinery Co.*, 1818 Reading Road, Cincinnati 2. Model 1-P3 operates in a vertical position and is propelled by a No. AV-belt using a detached motor or drive shaft. A one-piece shaft revolves on two high grade ball bearings mounted within the tubular section between the plate flange and the V-pulley.



Tubular Rivet

THE patented Rivnut of the *B. F. Goodrich Co.*, Akron, originally developed for aeronautical uses, is now available for a wide variety of industrial applications. It is an internally threaded and counterbored tubular rivet which can be headed blind, with a special tool forming a bulge or head on the far side. It is made of a corrosion resistant aluminum alloy. Two head styles, countersunk and flat, are offered, with the countersunk made in three shapes and the flat in one. Each is made in three nominal sizes, available in six grip ranges. They can be supplied with open or closed ends and with or without keys under the head in all styles except the thin head countersunk type, where the key cannot be supplied.

Wire Rope Clamp

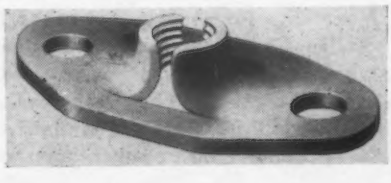
FOR use with small wire rope on planes, aerial masts and new mechanical devices, the *National Production Co.*, 4561 St. Jean Avenue, Detroit 13, has added four new sizes to their Safe-Line clamps. A patented feature is the inside grooving to fit the rope. Fifteen sizes are now available, ranging from 1/16 to ¾ in.

Pneumatic Filing Tool

A PNEUMATIC hand tool for fine finish filing of die casting dies, plastic molds and airplane parts has been developed by the *Keller Tool Co.*, Grand Haven, Mich. It can also be used as a portable power saw for making irregular saw cuts by substituting a hack saw blade for the usual file. The tool, No. 000-F Model 1416, is made in one size with a free speed rating of 1500 strokes per min. and with a fixed length of file stroke of 7/16 in. The design includes a rotary air motor together with a cam and piston utilizing ball bearing assembly to transfer the rotary motion of the motor to the reciprocal action of the file.

Speed Nut

A "HI-STRESS" speed nut, conforming to AAF specification No. 25531, has been developed by *Tinnerman Products, Inc.*, 2040 Fulton Road, Cleveland 13. The nut is a light weight, one-piece integral unit with an unusually low installation torque that allows speedier insertion of screws and bolts. It is said that it retains its self-locking torque even after many removals under service conditions. Interchangeable with nut plate AN362, it is identified as No. A6103H-1032.



Gage Protection

A TREATMENT for precision gages developed by *Protective Coating, Inc.*, Box 56, Strathmoor Station, Detroit 27, is claimed to double gage life. Micronoil is a liquid, a formulation of essentials that acts to set up wear resistance in the surface of the metal as well as on it. It is applied either by dipping or brushing onto the leading edge of the gage at intervals determined by usage. It is recommended for precision dies, punches and for tapping and reaming operations on all metals.

Permanently Locking Screw

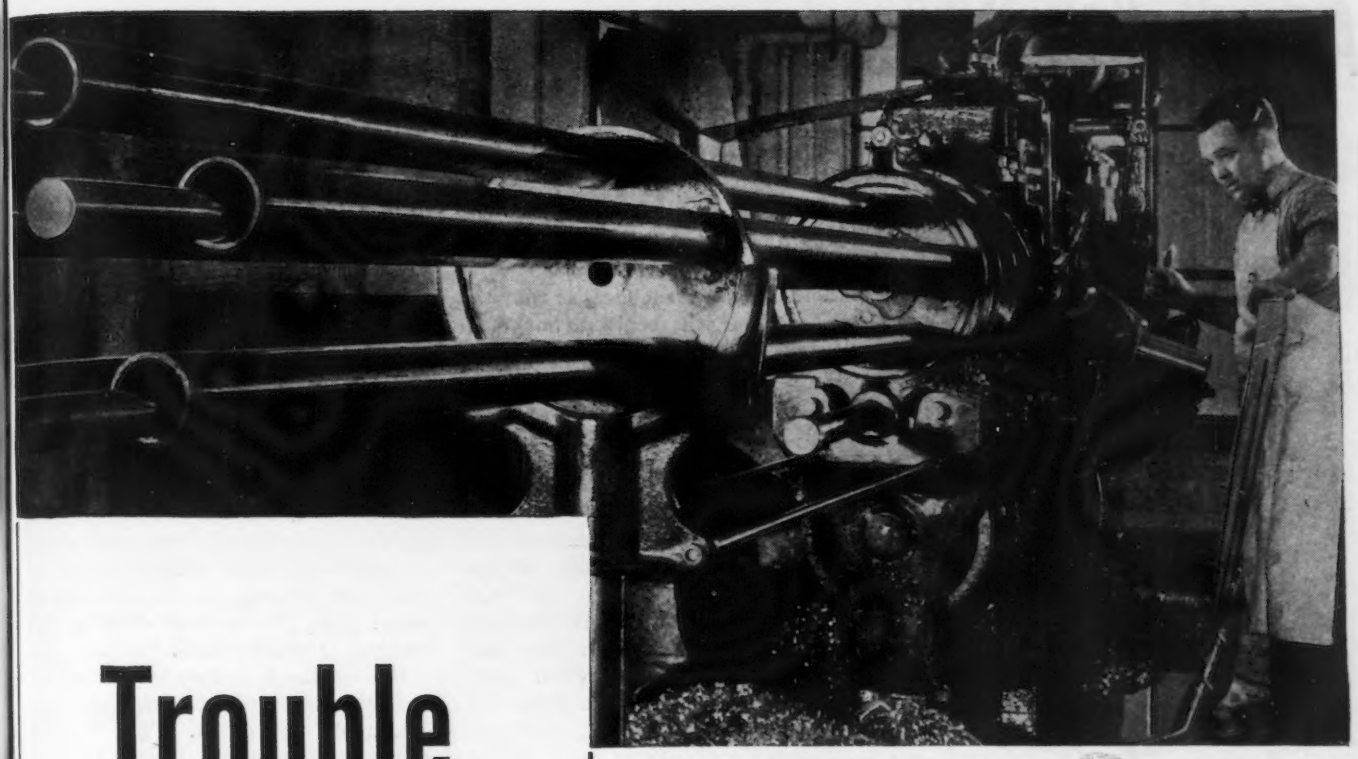
THE No-Slip screw placed on the market by the *Wilson Infra-Red Mfg. Corp.*, 152 W. Erie Street, Chicago, has two threads of different pitches. With each turn of the screw, the boards are pulled together by an amount equal to the difference between the pitches of these threads. When the screw is fully engaged, the top may be wiggled with a pair of pliers until it breaks off at the groove which is just above the fine threads, or a hard twist on the screwdriver will result in the screw twisting off at this point, making a permanent fastening.

Adjustable Hole Cutters

A SET of three adjustable hole cutters that cut diameters from ⅝ to 3½ in. is announced by the *Robert H. Clark Co.*, Beverly Hills, Cal. They are made with straight shanks for use as hand tools, in portable electric and pneumatic drills or in light drill presses. They may also be used in lathes and other spindle-type machines. The cutters consist of a straight shank on a hexagon body, into which are set three high-speed steel blades at 120 deg. intervals.

Rotary Files

HELLER BROTHERS CO., 880 Mount Prospect Avenue, Newark, N. J., announces that it is now making a complete line of hand cut rotary files for use on flexible or stationary shaft filing machines, portable electric and air tools and similar devices. These power-driven rotary files are obtainable in flame, ball, cone, tree, oval, cylindrical, tapered and other shapes recommended for the fast cutting of hard metals. Each shape is available in a number of sizes, as well as in rough, coarse, fine and smooth cuts.



No trouble here: Revere Free Cutting Brass Rods, 1-5/16 inch diameter, 120 inches long, are fed into this five-turret lathe, which counterbores, spots, drills, reams, forms, and cuts off an endless stream of finished caps for the rotor units of electric clocks. This brass is ideal for high-speed automatic machining.

Trouble Tickles Revere

EVERY once in a while somebody has difficulty with materials. That's true of every industry, every product.

Revere knows the non-ferrous metals, because it has been working with them since 1801 and cooperates closely with customers in ironing out troubles. It's a give-and-take process, this method employed by Revere. Time after time, we have been asked: "What alloy should be used for such and such a part? It has to be just so hard, resist the corrosion of this and that, and the weight, size and cost restrictions are thus and so." And again: "The metal we are using isn't performing as we expected. Is there something wrong with our fabrication, or should we change our specifications?"

Revere doesn't pretend to supply all the answers immediately, but if it is humanly possible to better your experience, we will be glad to help. It is always a pleasure to dig into difficulties and cooperate with you in reducing them, if not eliminating them entirely. This help is given freely, without obligation, of course. All you need do is *ask*.

• • •

There is much helpful information in "Revere Copper and Copper Alloys—Technical Information for Product Designers." This manual has 54 pages, 106 graphs relating to the physical and metallographic properties of these alloys under varying conditions, a new chemical and physical properties chart, and valuable illustrated data on welding. Ask for your complimentary copy.

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Assembly Line . . .

STANLEY H. BRAMS

• Shortage of castings throws a shadow over the forthcoming requirements of war and civilian goods... Higher wages, more facilities and a smaller draft drain are planned to remedy the situation.

DETROIT—Production of castings has reached the critical stage, and unified government attention is being concentrated on the foundries. The word has been passed along to regional agencies from Washington to do everything in their power to increase foundry output. In a word, this means higher wages, even at the expense of possibly breaking through the Little Steel formula, widespread and quickly attained facilities grants, and as much special consideration from Selective Service as possible.

Out of about 2800 foundries which were operative at Pearl Harbor, some 200 have closed their doors due to decreasing income returns and labor troubles. The loss of these operations, along with reduced production in other foundry establishments, cut down output from about 15,500,000 tons made nationally in 1942 to little more than 12,000,000 tons last year.

During the last half of this year the foundries barely held their own, and, in fact, tonnage output in somewhat more than 200 key plants, many of them in Michigan and the nearby area, increased around two per cent between November and March. But in April of this year the previous small gains were more than washed away in a 10 per cent decline, and indications are that May showed a further drop, although not of those proportions. These figures are national, and they are duplicated in the Central Midwest where the output of complicated castings is concentrated.

Manufacture of castings generally preceeds by about 90 days the completion of final assemblies, so that the April decline will begin to make itself felt in July. At that time the heavy truck program and the landing craft program, both scheduled for increases unless Germany collapses in the meantime, will be impaired. The extent of enlarged needs on castings for these and other items is indicated by the fact that requirements are supposed to rise an average of approximately 25 per cent by next August. And this output is employed right through the entire war and essential civilian production programs. Malleable iron castings are required for trucks, landing craft and farm machinery. Gray iron shapes are needed for cylinder heads, blocks and freight car wheels. Steel castings are required for railway cars and locomotives.

The recent decline is simple to explain, and to an extent it is seasonal. Workers have traditionally deserted the hot foundry jobs during the summer months. But never before did this take place at a time when the industry was already about 20,000 men short and when schedules were in such high ground.

To counteract this drift of manpower away from the foundries, War Labor Boards throughout the country appear to be looking with considerable favor on applications for pay raises in foundries. Base rates of 85 to 90c. per hr. for unskilled foundry help in most Michigan points may be enlarged, and in the enlargement may well go beyond the 15 per cent limitation of the Little Steel formula, on the grounds that these are hardship cases which can be exempted from the yardstick rule.

THERE has been talk of a blanket wage raise in the foundry industry, but competent sources believe this is unlikely to come to pass. There are several reasons. One is that there is a definite and general desire to preserve cost differentials existing between ferrous and non-ferrous foundries. Inasmuch as the aluminum and die casting foundries are not experiencing the same keen problems in meeting schedules as the iron and steel foundries, there would be no justification for raising their wage rates, and so any advances in the ferrous foundries would destroy the differential and considerably upset postwar stabilization.

At the same time, higher wages would mean that the nearly profitless operations of the foundries today would be transformed into definite losses, necessitating OPA approval to raise the prices on finished goods. Blanket OPA raises have also been talked about, but this is obviously impossible in the light of the great chain of price advances which would be necessary through the progression of metal from the casting stage to the finished assembly stage.

Beyond the fact that help is scarce and problems are manifold, the men obtainable are green. This has resulted in one of the highest scrap rates on castings in history. The high rejections within the foundries have been followed by very substantial rejections from purchasers after they inspect deliveries. Many foundries have cancelled contracts in recent months on the simple grounds that their rejections have been running so high that the arrangements made are no longer profitable. Naturally the OPA ceilings on the completed goods have been a factor in this situation.

Another factor not generally realized has been the relative scarcity of supervisory help. Some foundry managers report that the spoilage rate would probably be reduced if skilled supervisors were available to keep a closer eye on operations, advise employees of malpractices and correct them.

Much talk was recently heard on the subject of importing Mexican labor, probably 40,000 men, to meet the foundry common labor shortage. However, this program has now been abandoned, due mainly to inability of the Mexican government to supply that much help.

SELECTIVE service provides another problem today and its draft in the past is a hangover headache for the foundries. At the start of the war, it will be remembered, the foundries were not critical producers, and as a result Selective Service skimmed off the cream of their manpower—the young men who were able to work long hours. Of 5600 forge and foundry workers under 26 years of age in critical plants, only 730 have been

P&W Roll Thread Snap Gages

500,000 CHECKS ... and still doing an A-1 JOB!

Here at Pratt & Whitney we've made Roll Thread Snap Gages . . . thousands of them . . . for so many years that we *know* what they can do. For a typical example (and we have hundreds) one of them in an eastern plant — a ½"-32 P&W Gage — has already checked 500,000 screw threads without adjustment and is still going strong. A recent careful inspection of this gage shows *no perceptible wear! This gage should check more than a million pieces and still be in excellent condition.*

When you purchase a Pratt & Whitney Roll Thread Snap Gage you buy with it years of Pratt & Whitney pioneering experience and craftsmanship. As it so handsomely is paying the manufacturer cited above, it will pay you, also, to specify Pratt & Whitney Roll Thread Snap Gages. The precision and quality in any P&W Gage not only guards your production but pays big dividends.

P&W Roll Thread Snap Gages are fast, convenient, economical . . . revealing errors in lead, profiles, thread angle, roundness, straightness and diameter. Write for our literature and get the whole story.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

deferred until now. In Michigan in recent weeks some foundry workers have insisted on cutting hours from 48 to 40 for the simple reason that they are physically unable to keep up the pace.

Selective Service is moving to remedy this by putting foundry men into preferred position, but this does not entirely solve the situation. Blanket deferments have been suggested, but the law forbids placing an entire industry in preferential position.

The War Manpower Commission is joining the drive to aid the foundries by putting critical plants at the top of their manpower referral lists. This program will likely be enlarged in forthcoming weeks.

Facilities, meanwhile, are being allocated by WPB wherever they are proved necessary. Awards for plant improvements thus far amount to $14,000,000, allocated about a year ago, much of which has been placed in Michigan.

The Buick Gray Iron Foundry, Flint, is being retooled to manufacture truck engines, cylinder blocks and head castings. Additions and alterations costing $375,000 are being made to the plant.

Around $1,700,000 has been allocated to Wilson Foundry & Machine Co., Pontiac, to renovate its facilities. Of this, $380,000 provides for re-equipping and rebuilding of the core room, so that its capacity will match that of the rest of the foundry. This entire program at Wilson is about half done, and when it is completely finished it will make the foundry one of the most modern in the country.

Modernization facilities have been authorized for Lakey Foundry and Campbell, Wyant & Cannon Foundry Co., Muskegon. This work is now being done and should have been completed before now, but was slowed down by the unavailability of construction labor in a city which is already over its manpower head.

In Muskegon, incidentally, the establishment of manpower ceilings on the various plants has been of some aid to those two big foundries. With severe restrictions placed on the ability of foundry workers to find new jobs, employment in the foundries has held at rather high levels, while at the same time turnover through the city reduced from 6.5 to 4.3 per cent. Perhaps the national tightening of manpower rules on July 1 will aid the foundry problem.

Union to Ask for Severance Pay

Detroit

• • • **All aircraft locals** of the United Automobile Workers Union, C. I. O., have been asked by their international director, Richard F. Frankensteen, to begin negotiation with their managements to provide for severance pay for members when war contracts end.

Citing the Brewster Aircraft Corp. termination as an example of what might be felt in the future, Frankensteen said that information from Procurement officials was that there would be additional contract completions before the end of this year. He added, "New war contracts will simply not be available for replacement as they have been in the Brewster case. Despite the best that industry, labor and government can do, there will be inevitably displaced workers in the aircraft industry."

The UAW aircraft department proposals would provide for severance pay amounting to four weeks' pay, on a 48-hr. week basis, computed at the highest rate received during the last six months but less than one year. If the employee has been on the company payroll for a year or more, severance pay would be the equivalent of eight weeks' pay.

Frankensteen recommended that the severance pay clause proposal be made to the management for inclusion in the contract and if management refused to accept—something he anticipated—steps should be taken to call in a conciliation service and certify the dispute to the National War Labor Board.

Hearing on Foremen's Rights Begins at Detroit

Detroit

• • • **Hearings on the question** of bargaining rights for foremen got under way this past week at Detroit, and were expected to continue for at least the balance of the month.

Simultaneously it was made known that the Automotive Council for War Production had recommended a seven point program to its 550 member companies as a minimum in the handling of foremen personnel matters.

The seven points were listed as follows:

1—Define clearly who is a foreman; distinguish him from straw bosses, leaders, and others without that status, and define clearly the elements of his job.
2—Bring earnings of foremen into proper relationship with those of workers whom he supervises.
3—Make clear to foremen policy as to promotion, demotion and discharge, and explain carefully the reasons in each case of change of status.
4—Take necessary steps to prevent undermining of foremen's status and position through union activity and functioning of union steward system.
5—Review carefully functions of labor-management committees to insure protection of foremen's status and authority.
6—Provide adequate training programs for new foremen; any others to the extent needed.
7—Develop personal leadership from top to bottom of management ranks in lieu of dependence upon authority of rank.

Rush of Job Seekers Lightens Cleveland Employment Problem

Cleveland

• • • **This city,** a Class I acute labor shortage area, is experiencing a new rush of job seekers which promises to lighten the employment problem if it should continue for any length of time. USES offices here for the last few days of last week recorded an average of about 2800 new job seekers per day which compares with a normal flow of not over 200 or 300.

High school students seeking temporary work for the summer are accounting for a large percentage of this number but in-migrants have also increased by at least 100 per cent. Newcomers to the city are flocking to the USES offices at the rate of about 500 per day, according to Dr. Edmunds, area manpower director, and about 285 of these are being passed along to employers daily. Many arrive here unprepared with releases from former employers which accounts for the delay of many of the cases.

Dr. Edmunds stated that he believed that the sudden inflow indicated spotty unemployment in other sections of the nation which was hastening the flow of workers toward key centers. Most of the in-migrants coming here are coming from Pennsylvania, West Virginia, Tennessee and other southern states.

It is expected that this sudden upturn will aid the labor market here perceptibly if it continues. About 60 per cent of the applicants are male among the in-migrants although a high percentage of the high school applicants are girls. Referrals to heavy jobs have not found many takers so far but since the women and high school applicants will soon fill up most of the lighter jobs it is thought that the latter in-migrants will be forced to accept the heavier jobs from lack of choice.

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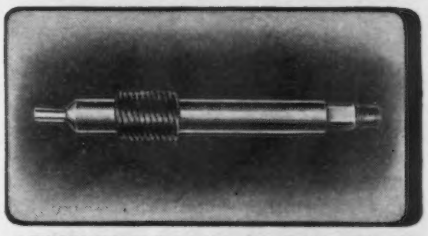
. . . with Uniform, Easy-to-Use Carpenter Stainless

Start now to put the advantages of Carpenter Stainless Steels to work in your products—corrosion resistance, high strength/weight ratio, fatigue resistance, special physicals. You'll find Carpenter Stainless Steels cost less to use because they are easier to use. Soft and ductile Carpenter Stainless Strip blanks cleanly and forms easily. And the uniform qualities of Carpenter Free-Machining Stainless makes possible better finishes, faster cutting speeds, fewer rejects.
Here are some of the many ways in which Carpenter Stainless Steels are helping other Stainless users lick their specialized problems.

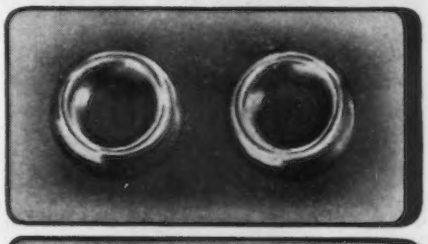
✓ *Mass-Production Possible*

These aircraft gear segments had to be machined to .0005" tolerances. Mass production of these parts became possible when the manufacturer went to Carpenter Free-Machining Stainless #5 (Type 416).



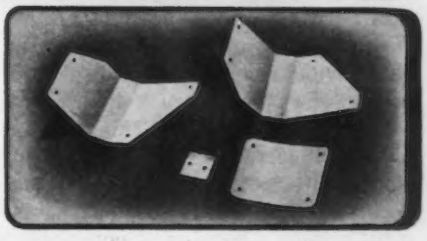
✓ *Free-Acting for Life*

Here in the valve stem of a heavy gauge valve, Free-Machining Stainless #5 (Type 416) provides the positive corrosion resistance and non-galling properties that assure long, trouble-free service life. Smooth-acting parts like these can be economically produced from Carpenter Stainless #5 and #8 bar stock.



✓ *Stops Costly Rejects*

The problem of these grommets splitting around the edges of the inside holes was completely eliminated when Carpenter Stainless #6 (Type 430) was used on the job. This is typical of the way easy-working Stainless Steels banish fabrication headaches and help keep production costs in line.



✓ *Light and Extra Strong*

In these Naval ordnance parts, Carpenter Stainless #6 (Type 430) combines corrosion resistance with strength, rigidity and light weight. And faster fabricating of these parts is possible too, thanks to the uniform temper and high ductility of this Stainless Steel.

If you would like further information on these Stainless Steels write for our 98-page book "Working Data for Carpenter Stainless Steels". For personal assistance in the shop call in your nearby Carpenter representative.

The Carpenter Steel Company • 121 W. Bern Street • Reading, Pa.

Carpenter STAINLESS STEELS

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Strength
Rigidity
Heat Resistance
Corrosion Resistance
Longer Product Life
Sales Appeal

BRANCHES AT
Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

Washington . . .

L. W. MOFFETT

• Status of P-47 Thunderbolt contract causes discussion . . . Nelson to announce soon that manufacturers needing machine tools and other equipment can place orders for future delivery if WPB ok's them . . .

WASHINGTON—The War Department says that the status of Republic Aviation Corp.'s contract for the P-47 Thunderbolt remains unchanged, but government officials in other departments are discussing what to do with the Farmingdale, N. Y., facility and its employees when the contract is slashed. The War Department declines to say whether the termination is contemplated and says that when it is proper, the department will make the announcement.

* * *

• **WPB Chairman Donald M. Nelson** last Saturday announced that manufacturers needing machine tools and other industrial equipment can place orders now for future delivery provided WPB ok's them. This will enable producers to anticipate their equipment requirements for reconversion, and will give tool and equipment makers a backlog of nonmilitary orders.

WPB will select the concerns to receive the business, with preference going to those companies which will be able to make the earliest deliveries consistent with consumer demand. This depends upon the amount of war business a tool manufacturer has, and how soon he can devote manpower and capacity to the needs of civilian business without interfering with war orders.

While WPB expects that most general purpose tools will be secured through application for second hand surplus tools, most special purpose tools needed for reconversion will have to be made according to order.

Also, Mr. Nelson will soon say that the restrictions on the use of materials for model making and postwar research will be lifted. At present, manufacturers can get materials for experimental purposes on appeal. The new rule on postwar models is that manufacturers may apply to the WPB regional offices to obtain materials and components to make a single working model no matter whether it is a bobby pin or a new type merchant ship.

* * *

• **The Production Executive Committee** staff, the new interagency high command which must approve all cutbacks, is headed by Arthur H. Bunker, WPB Metals and Minerals Vice-Chairman. In addition to mapping out where cutbacks will fall after the procurement agencies have indicated programs should be trimmed, the new staff will try to find more war business for companies so affected.

The staff met every day last week and devised a form to report termination and established a list of $12,000,000 a year as the floor for reporting purposes. A number of companies may be involved in the minimum cutback of a program or only a few.

So far as possible cutbacks will be made in relatively free labor areas and companies and employees will be given 90 days advance notice of the government's intention to cancel. Many cases now coming within the purview of the staff resulted from cancellations not governed by the 90-day rule, so difficulties in handling laid-off employee problems may be expected.

Special consideration is being given to subcontractors because it is realized that their problems in termination may be even more acute than those of prime contractors. Every effort will be made to cushion the shock of having to dispose of component, part and supply inventories held by subcontractors by giving them the same notice prime contractors receive.

* * *

• **Some foreign trade** experts are despairing of the United States postwar outlook for a huge profitable export market because of the babel of opinion both in business and government. They say if the United States accepts raw materials in payment for war debts, and gives away the greatest part of war surpluses, particularly of the industrial type, the prospects are dismal.

Opinion is split three ways among the controlled traders, free traders and no-traders. Discussions on export are confused by doctrinaires who advocate this theory or that which are all tied to a knock-down and drag-out over whether free competitive capitalism will be endangered by the Third Freedom or Article 7 of the Master Lend-Lease Agreement.

WPB, FEA and Commerce are generally in agreement that cartelism if adequately controlled will be a blessing. During the transition period, there is considerable opinion at FEA that FEA should be a sort of super-Amtorg conducting all foreign trade until free private foreign trade can be re-established. These sentiments have their proponents in the War and Navy Departments, but there are many dissenters. Mrs. Roosevelt is said to favor cartels.

The Justice Department is against all the planners. Recent speeches of Assistant Attorney General Wendell Berge have been so anti-socialistic and so pro-free-enterprise that they might have been written by Eric Johnston or Herbert Hoover.

The State Department which will finally settle United States policy on this question is quietly telling business men "no" to many of the international deals brought before the Commodity Division for approval. Indications are that pre-election policy, at least, will be to use the weight of arguments that the United States has spent $300,000,000,000 and thousands of lives in pulling European chestnuts out of the fire, and with the promise of postwar reconstruction assistance, plus Russian approval, to extend the effect of the Anti-trust laws to all of the United Nations.

The epithets of "corporate syndicalism" and "Fascism" as applied to international monopolies are hurled about just as frequently at State as at Justice.

Meanwhile, State Department officials say that they want to see American business men who think that foreign governments are about to exclude them from foreign markets, or who have any other export problems. State officials say that this country has plenty of weight it can throw around, and that every aid will be given to business men. Commodity agreements as in oil, cotton and wheat, seem to be last ditch resorts.

695 Plastic Magnesia Refractory

For a hundred hot repairs

695 is a convenient, ready-to-use plastic basic refractory. It is as handy to the furnace operator as putty in a paint shop.

Open hearth and electric steel men find 695 ideal for quick, hot repairs of furnace hearths and linings — for open hearth front walls and backwalls, skewbacks, monkey walls, bridge walls and air uptakes, for lining open hearth runners and electric furnace spouts, for patching holes and cracks in big ingot molds, and for repairing soaking pits. Numerous other successful, emergency applications are noted regularly. This plastic is best known, perhaps, as a tap hole material, the application for which it was originally designed. That is still its largest use. Customers report that 695 tap holes frequently give twice to three times the number of heats obtained with previously used mixtures.

695 has a melting point well above 3600° F—verified by pyrometric cone tests and substantiated by its satisfactory performance over long periods in the hottest parts of both electric and open hearth furnaces.

If you haven't been using 695, now is the time to take advantage of its time and trouble saving features. It comes in convenient 100-pound bags ready to mix with water. Include some in your next carload order of refractories.

BASIC REFRACTORIES, INCORPORATED *Cleveland 15, Ohio*

Byrnes Predicts Unemployment Before War's End Due to Cutbacks

Washington

• • • **Predicting** unemployment before the year is out because of heavy war production cutbacks to come even though the war with Germany continues, War Mobilizer James F. Byrnes recently urged passage by the House of the Murray-George contract termination bill. Mr. Byrnes told this to the Senate military affairs subcommittee and inferred that while the executive agencies are well ahead in their postwar planning Congress has lagged.

After Germany falls, still greater terminations are planned. The latest WPB estimate on this score is that contracts will be slashed 50 per cent.

Mr. Byrnes, though insisting that the defeat of Germany is far distant, said that Congress must enact legislation to ease the impact of demobilization. He made the following recommendations which were generally in accord with those made by the Senate postwar committee.

1. Contractors should place orders for postwar machine tool and industrial equipment needs now. (WPB will soon give the word and tool manufacturers and others will be permitted to produce as much post-war equipment as there is capacity freed from military demands.)

2. That the General Accounting Office function with respect to termination be confined to examination of settlements to prevent fraud. An audit would necessitate a huge postwar outlay of money for public works and relief.

3. That the states be induced to liberalize their unemployment compensation laws by providing federal funds is necessary during the reconversion period.

4. Funds for transportation of migratory workers back to their homes at federal expense.

5. Unemployment compensation for federal industrial workers.

6. Extension of the authority and lending powers of the Smaller War Plants Corp.

7. Enactment of a surplus war property legislation.

8. Enactment of postwar tax bill to relieve the stringency of war taxes.

9. Public works, including highway aid from the federal government.

10. Creation of an Office of War Mobilization and Postwar Adjustment.

Cold Rolled Steel Problems Discussed

Washington

• • • **The possibility of** increasing production of cold rolled sheets without decreasing the available tonnage of hot rolled sheets was discussed by the Sheet and Strip Industry Advisory Committee at its recent meeting, WPB reported. The government presiding officer introduced the suggestion as an attempt to secure additional sheets of the type now most in demand.

Shortage of labor and materials involved in packaging metals for export also occupied the attention of the committee. One member declared that shipments from his plant have been considerably delayed, due to lack of personnel and materials required in wrapping and bundling operations. He pointed out that half the space in his finishing department now was used for packaging purposes. This operation is considered a bottleneck in most mills, it was brought out. A reduction in wrapping, which would release labor for productive activities was advocated by the committee.

At present, two waterproof papers, and one water repellant wrapping are used in packaging materials stored in the holds of ships bound for various war theaters. The committee favored abolition of the water repellant wrapper. Army and Navy representatives agreed that this would be a desirable speed-up measure, except in those cases where the protective paper would be necessary to prevent corrosion.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

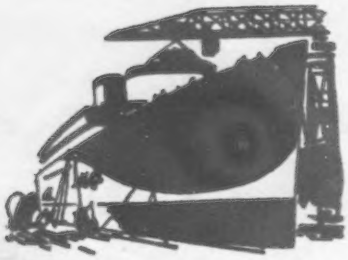
See Need For Cap Screws

Washington

• • • **Large ordnance requirements** for cap screws for replacement use overseas will tax the capacity of the industry, members of the Cap and Set Screw Industry Advisory Committee said at their first meeting, according ot WPB. The present backlog of orders averages six months, committee members said, and in some cases runs to a year, since many customers place orders for months in advance. Requirements for these products for the farm machinery and truck-trailer programs are also large, WPB officials told the committee, and may increase. No solution was arrived at as to how to bring requirements into line with production. Ordnance requirements will be studied carefully with a view to possible reductions, WPB officials said.

WEST COAST . . . OSGOOD MURDOCK

• Like Aesop's obliging traveler, Geneva Steel Co. is expected to serve many masters and accommodate all . . . Kaiser gets set to throw Fontana's throttle wide open.



SAN FRANCISCO—Once upon a time a man set out on a journey with his son and his donkey. Along the way a passerby took the man to task for making his little son walk, so he set the boy on the donkey. Further along he was belittled by another passerby because he was walking while his son rode, so he mounted the donkey also. Soon he was again taken to task for overburdening the helpless donkey. So the man and the boy walked and carried the donkey. Then everyone laughed and jeered. The more the man's attempts to follow good advice and satisfy each advisor, the less his peace or progress.

Once upon another time a great steel plant was planned in Utah, advantageous to favorable supplies of coal, iron and limestone, but remote from big markets or from industrial labor supply. It was constructed during the stress and shortages of war emergency. Its original primary purpose was to supply ship plates for the construction of Maritime and Naval vessels on the West Coast. Of its 900,000 tons approximate rated annual capacity, 700,000 tons were to roll out as plate, as soon as possible.

When logical, realistic administrators decreed that nothing but plates should be produced, at least during the war emergency, a tremendous local howl went up that its future was being threatened. So, to accommodate the industrial destiny of Utah, energy and labor were diverted toward completing structural facilities. Then urgencies for high octane aviation gasoline plants and higher rated munitions plants diverted labor to other areas and there were also prohibitions against recruiting labor. Again the management of the steel plant conceded and yielded, attempting to follow orders as they were issued. Finally blast furnaces, open hearths and rolling mills were sufficiently completed to start partial operation. But lo! A crucial shortage of foundry iron developed, so one of the furnaces was diverted to supply pig for the West Coast in spite of pressing shortage of coal and ore miners and furnace and mill operators. So plate schedules fell behind.

Having now attempted to please Defense Plant Corp. in its original plans, the Maritime Commission with plate, the War Production Board with foundry pig and the War Manpower Commission with respect to labor, another important suitor with an ardent request appears on the crowded, hard-pressed scene. Army Ordnance and the new shell division of the Kaiser Co., Inc., have contracted to utilize a great ordnance plant at Denver. So, in addition to its other commitments, limitations and schedules, accommodating, harried and all-serving Geneva is now instructed to prepare to start shipping by October from 12,000 to 13,000 tons of shell steel billets to Denver every month.

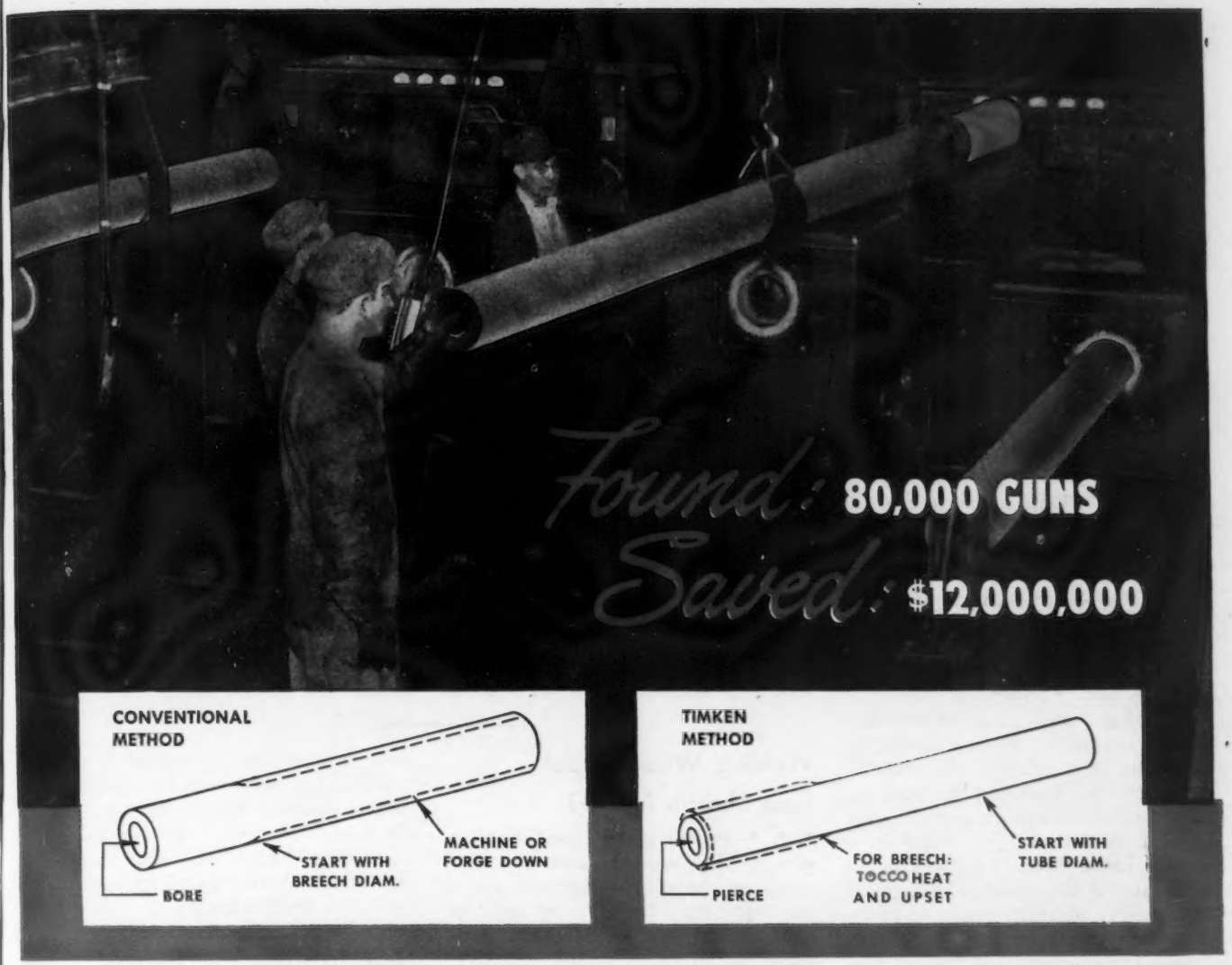
Like the man with the son and the donkey, the Geneva Steel Co. seems to have tried faithfully and earnestly to follow all suggestions and take all orders issued by its various public masters. A week or two ago War Manpower Commission relaxed its restrictions to the extent that recruiting of labor will now be permitted from Kansas, New Mexico, Oklahoma and Arkansas. This may help to provide the necessary coal and ore miners and operators for coke ovens, furnaces open hearths and rolling mills. In recent weeks, even as plates are complete, sufficient labor has not been available to ship them. The serious temporary shortage of foundry pig iron on the West Coast was relieved by running one furnace on foundry grade temporarily. Far western analysts on the sidelines cannot yet understand how Geneva can be expected to reach anywhere near its rated capacity of 58,000 tons of plate per month with labor over 2000 men short, and at the same time divert from 8000 to 10,000 tons of monthly furnace capacity to foundry grade pig, and from 12,000 to 13,000 tons of ingot capacity to shell steel billets. *Quien sabe?*

SUGGESTION on this page last week that the steel division of Kaiser Co., Inc., was "contemplating" four additional open hearths was without solid foundation. The management is proud and pleased that, for the first time, it can now operate all six of its open hearths at Fontana, secure in the knowledge that all ingots will be needed for plate mill commitment or for shell forgings. The blooming mill in connection with the structural facilities is now ready to operate and will be used in connection with the shell program. Wire drawing will be an adjunct to the completed structural mill but may not be used during the emergency. The new electric furnace is now ready to use. During May, Kaiser open hearths produced 50,084 tons of ingots and the blast furnace produced 1446 tons of iron in one day recently. It is expected that June will record a peak iron production that may be a record for one furnace for the entire country.

When Henry J. Kaiser announced the appointment of Dr. Paul F. Cadman as his director of research and assistant to the president, he added to his staff a brilliant economist and educator of national standing who has recently been director of the research council of the American Bankers Association in New York. Dr. Cadman was a former member of the faculty and dean of men at the University of California and has a wide following on the West Coast as a brilliant speaker, scholar, author, student and master of business and commerce. For four years he was executive secretary of the San Francisco Stock Exchange.

* * *

• Announcement of the Northrup-Hendy Co., jointly owned by Northrup



WHEN war came to the U. S., we faced a bottleneck in forging and machining to produce bofors and heavy guns for tanks, airplanes by the conventional method. Had it not been for Timken Roller Bearing Co.'s development of a new way to make gun barrels from seamless steel tubing, serious shortages in arms would have occurred at a critical time.

TOCCO Induction Heating plays a vital part in this new method (see sketches), affording accurate, localized heating, essential for uniform upsetting of the tube to form the gun breech. Speed of heating practically eliminates scaling, minimizing wear on dies.

By this speedy method, Timken Ordnance Co. produced more heavy gun tubes per month than England turned out in two years up until April 17, 1942. In less than 2 years, the plant added 80,000 75 m.m. and 40 m.m. gun barrels to Allied strength and did this at a saving of $12,000,000 over the former method.

Four TOCCO Inductors, powered by two 200 K.W. TOCCO JRS. heat the entire output. End of 75 m.m. tube (7" o.d., 2⅜" i.d.) is heated for a length of 18" to 2350° F. End of 40 m.m. tube (4¾" o.d., 1¼" i.d.) is heated for 15" length to 2350° F.

Find out how the speed, economy and uniformity of TOCCO can aid *your* war production and post-war strategy. "Results with TOCCO" free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND, OHIO

TOCCO

HARDENING..BRAZING
ANNEALING..HEATING
★

Aircraft, Inc., and the Joshua Hendy Iron Works, brings together for research and development purposes the enterprise and potential resources of two war grown but long established far western industrials. For nearly a year, it is announced, friendly negotiations have gone on between officials of the two companies and henceforth the varied facilities of Northrup in aircraft and Hendy in marine engines, electrical equipment, pumps and heavy industry will be jointly available. A. J. Phelan is chief engineer for Northrup and has an extensive staff of research engineers and technicians working on possible postwar developments. So effective and acceptable has Northrup's new P-61 Black Widow heavily armored fighting plane proved itself to be, that Army and Marine Corps orders have materially stepped up production schedules and provided a backlog to keep the plant busy for two years.

* * *

• Although there are 40,800 less women employed in manufacturing industries in California than in August, 1943, the peak month, there are still 235,500 women industrial wage earners, according to the State Division of Labor Statistics, Department of Industrial Relations. Employment of women in aircraft continued to decline, last month by 2400, to 88,300. Shipbuilding engages 36,700 as production workers compared with 18,900 a year ago. The same report names male wage earners in manufacturing industries as 598,100, the first time it has fallen below 600,000 since July, 1942.

WPB Reserves 15,000 Tons Carbon Steel for Farm Machinery; Equipment

Washington

• • • **WPB last week** announced the establishment of a reserve of 15,000 tons of carbon steel and proportionate amounts of other controlled materials for delivery under third quarter 1944 allotments to be used with idle and excess inventories and in the production of farm machinery and equipment. This action was taken in Directive 4 to L-257.

Manufacturers who desire to increase their quota of any item listed in Schedule B of the order, and new manufacturers with no quota, are required to make application on WPB form 3788. Application forms may be obtained from local WPB field offices. When properly filled out, these forms should be mailed to the WPB Farm Machinery and Equipment Division, Washington 25, D. C. In the case of manufacturers who need allotments of controlled materials, the application for increased quotas must be accompanied by form CMP-4B.

To be assured of consideration, applications for participation in this special program should be filed not later than June 26.

WPB officials explained that applications would not be granted if participation involved substantial allotments of the following critical materials: Steel-plates, sheets, strip, tin mill products, forgings, seamless tubing, wire rope and strand; Copper and Copper Base Alloy Products; rod, ½ in. and smaller, fine wire, cable, tubing of 4 in. and over.

Welding Wire Output Rose Sharply in 1943

• • • **Production of steel** welding wire by the steel industry in 1943 rose approximately 45 per cent above the 1942 figure for a record total of 1,166,400,000 lb., according to estimates by the American Iron and Steel Institute.

The 1943 total was nearly two and one-half times the 1941 production of 453,120,000 lb. The 1942 output was 800,400,000 lb., somewhat more than three times the production in 1940 and almost double the output in 1941.

The sharp increase in the manufacture of welding wire in 1943 reflects the heavy production of war equipment of all kinds. Shipbuilding in particular has required large quantities of welding wire.

New Bombers Hit Japan's Largest Steel Mill at Yawata

Washington

• • • **The Imperial Iron & Steel** Works at Yawata, Japan's largest steel mill, was the target of the B-29 mission of the 20th Bomber Command on June 15. The bombing was accurate and effective. Enemy fighter craft offered some resistance to a few units. Anti-aircraft fire was moderate to intense over the target area. No enemy planes were reported shot down.

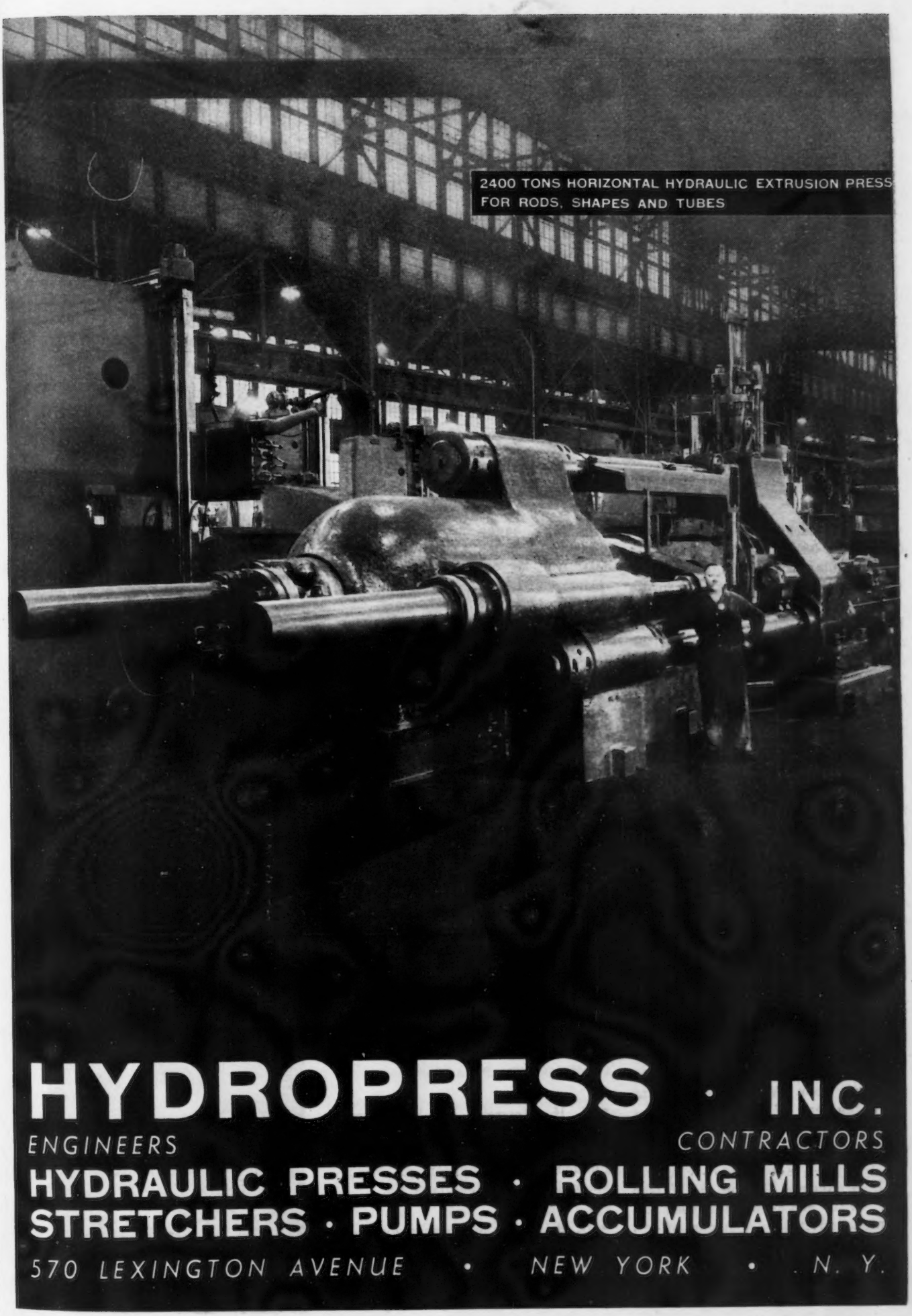
These mills are located at Yawata on Kyushu Island, the westernmost island of the home group. The island of Kyushu is a dominant heavy industry section, with shipbuilding, iron and steel production, aircraft construction, coal and metal mining, naval ordnance depots, and coaling ports.

The last known figures on iron and steel capacity at the bombed Yawata Works were: Iron—758,300 net tons; Steel—1,137,000 net tons. Total steel capacity of the four-island group that makes up Japan proper was about 3,600,000 net tons, before Pearl Harbor.

. . . Cited for Awards . . .

• • • **The following companies** have won the Army-Navy E award for outstanding war production:

Inland Steel Co., Indiana Harbor Plant, Indiana Harbor, Ind. (second star)
Mid-West Forging & Mfg. Co., Chicago Heights, Ill. (star)
Caterpillar Tractor Co., East Peoria, Ill. (star)
Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford.
American Red Cross, Blood Donor Center, Denver.
American Steel Dredge Co., Inc., Fort Wayne, Ind.
Associated Spring Corp., Raymond Mfg. Co., Corry, Pa.
Atlas Powder Co., Giant Division, Giant, Cal.
Automatic Signal Corp., East Norwalk, Conn.
Behr-Manning Corp., Norton Pike Co., Littleton, N. H.
Chromium Process Co., Shelton, Conn.
Cole Laboratories, Inc., Long Island City, N. Y.
Commercial Solvents Corp., Dixie Ordnance Works, Sterlington, La.
Davison Chemical Corp., Curtis Bay Plant, Baltimore.
Dayton Racquet Co., Inc., Arcanum, Ohio.
Downing Box Co., Milwaukee.
Eastern Heat Treating & Brazing Corp., New York.
Goodyear Tire & Rubber Co., Goodyear Clearwater Mill No. 1, Cedartown, Ga., and Goodyear Clearwater Mill No. 2, Rockmart, Ga.
Mansfield Tire & Rubber Co., Mansfield, Ohio.
Markem Machine Co., Keene, N. H.
Miller Mfg. Co., Detroit.
Milwaukee Stamping Co., Milwaukee.
New Haven Screw Machine Products, New Haven, Conn.
North Terminal Machine Co., Boston.
Oak Rubber Co., Ravenna, Ohio.
Plastic & Die Cast Products Corp., Los Angeles.
Scaife Co., Oakmont, Pa.
Stewart-Warner Corp., Green River Ordnance Plant, Dixon, Ill.
A. B. Stoves, Inc., Battle Creek, Mich.
Ward Products Corp., Cleveland.
Welch Allyn Co., Auburn, N. Y.
Wesley Steel Treating Co., Milwaukee Plant, Milwaukee.



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ENGINEERS CONTRACTORS

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N. Y.

WILLIAM BLACKIE and WILLIAM J. McBRIAN, vice-presidents, Caterpillar Tractor Co.

PERSONALS

• • •

• **William Blackie** and **William J. McBrian** have been made vice-presidents of Caterpillar Tractor Co., Peoria, Ill.; **William H. Franklin** has been made controller, succeeding Mr. Blackie. **Edward W. Jackson** has been appointed general parts manager of the company. Mr. McBrian, who has been treasurer of the company since 1938 and will continue in that position, joined Caterpillar in 1928. Mr. Blackie came to the Caterpillar organization in 1939, as controller.

• **Donald B. Williams** has been appointed assistant chief metallurgist at the Duquesne Smelting Corp., Pittsburgh. Mr. Williams formerly was associated with the Homestead Works of Carnegie-Illinois Steel Corp. and more recently was a metallurgist at the Duquesne Works of the same company.

• **Thomas J. Kearney,** formerly technical adviser to the director of sales, has been promoted to assistant chief engineer in charge of industrial equipment design and detailing in the Engineering Department, Detrex Corp., Detroit. **John A. Faler,** assistant chief engineer of the company has been appointed to take charge of extraction equipment development.

• **G. S. Rogers, Gordon O. Watson** and **W. T. McCargo** have been appointed district sales managers of new branch sales offices at Buffalo, St. Louis and San Francisco, respectively, of the Carborundum Co., Niagara Falls, N. Y.

• **S. M. Gahagen** has become Pacific Coast district manager of the Rustless Iron & Steel Co., with headquarters at Los Angeles. He succeeds **Thomas L. Moore** who becomes eastern sales manager, with headquarters at Baltimore. Mr. Gahagen was formerly chief plant metallurgist for the Vanadium Corp. of America.

• **W. I. Foss, Jr.,** has been made sales manager of the Transformer Division, Kuhlman Electric Co., Bay City, Mich.; **A. H. Ellerman** has been appointed assistant sales manager of the division. **J. E. Bevan,** former vice-president in charge of production in the Bethlehem plant of Roller-Smith Co., is now manager of Kuhlman's New York office, succeeding the late D. F. Potter, Jr.

• **Marcel A. Cordovi,** has joined the metallurgical staff of the Babcock & Wilcox Tube Co., New York, as research metallurgist.

• **Howard M. Givens, Jr.,** has been appointed manager of bar steel sales for the Midvale Co., Philadelphia.

• **V. H. Hiermeier** has been named industrial manager of the St. Louis office of the Brown Instrument Co., Philadelphia, a division of Minneapolis-Honeywell Regulator Co.

• **G. M. Dennis** has been made manager of the Philadelphia district office, Whiting Corp., Harvey, Ill. Mr. Dennis has been with Whiting for over 15 years in sales and engineering work.

• **J. F. Spellacy,** former superintendent of the 77-in. hot strip mill at the Jones & Laughlin Steel Corp., Otis Works, Cleveland, has been appointed to the newly created post of staff engineer; **B. F. Scott** succeeds Mr. Spellacy as superintendent and **W. J. McNally** has been appointed steel order supervisor, succeeding Mr. Scott. **Laird P. Lias** has been appointed assistant superintendent of the Riverside open-hearth department.

• **T. A. Farrell** has been named assistant general sales manager in charge of operations in the home office, Nash-Kelvinator Corp., Detroit; **E. R. Legg** has been appointed assistant general sales manager in charge of the commercial and contract division, and **D. A. Packard** has become assistant general sales manager directly responsible for sales and merchandising activities on all Kelvinator household products.

• **A. H. Kruger,** has joined Wheelco Instruments Co., Chicago, as application engineer.

• **Alex U. Steenrod** has been appointed manager, steel building products sales, Berger Manufacturing Division, Republic Steel Corp., Canton, Ohio. Mr. Steenrod comes to his new position from the Milcor Steel Co., where he was manager of the Canton plant.

ALEX U. STEENROD, sales manager, Berger Manufacturing Division, Republic Steel Corp.

• **J. K. Gannett,** vice-president of The Austin Co., Cleveland, who was recently appointed director of engineering and research, has been elected a director of the company.

• **G. S. Staunton,** formerly sales manager of the Ternstedt Manufacturing Division of General Motors Corp., has been named assistant automotive sales director of Bendix Products Division.

• **John F. Johannsen** has been named export manager for the Willamette Hyster Co., Portland, Ore., and Peoria, Ill. He was formerly export manager for R. G. LeTourneau, Inc., Peoria.

• **Emmet F. Harding** has been appointed assistant sales manager, the Corbin Screw Corp. Division of the American Hardware Corp., New Britain, Conn.

• **Dr. Zay Jeffries,** noted scientist and a pioneer in tungsten metallurgy and in the development of high-strength aluminum alloys, has been elected to the board of trustees of Battelle Memorial Institute. Dr. Jeffries is technical director of the Lamp Department of General Electric Co., Cleveland and chairman, Carboloy Co., Inc.

• **Albert R. Teifeld** has been appointed advertising manager of Copperweld Steel Co., Glassport, Pa. For the past 20 years he has been in the advertising department of American Steel & Wire Co., at Cleveland, where he supervised the electrical, wire rope and construction materials advertising.

ALBERT R. TEIFELD, advertising manager, Copperweld Steel Co.

WALTER L. MAXSON, director of research, Oliver Iron Mining Co.

BYRON M. BIRD, technical consultant, Jeffrey Mfg. Co.

• **Walter L. Maxson,** a metallurgist of national prominence, has been named director of research for the Oliver Iron Mining Co., Duluth, Minn., U. S. Steel Corp. subsidiary. Mr. Maxson, prior to joining Oliver Mining, was manager and chief engineer of the mining division of Allis-Chalmers Mfg. Co.

• **Arthur S. Klopf** has been made manager of the Iron Division, Firegan Sales Co., Chicago. Mr. Klopf comes to Firegan from Hansell-Elcock Co., where he was foundry manager.

• **Harry A. Fennerty** has been elected president of the Alliance Machine Co., Alliance, Ohio, succeeding the late W. H. Purcell. **G. W. Shem,** a director and also president of the Alliance Structural Steel Co., has been named chairman of the board of Alliance Machine; **R. J. Harry** has been appointed vice-president; **R. B. Stuckey,** secretary, and **B. A. Tuttle,** treasurer.

• **Virgil E. Boyd** has been appointed Detroit central office manager, Nash Motors Division, Nash-Kelvinator Corp.; **Don D. Boden** has been made St. Louis zone manager and **J. B. Fountain,** Milwaukee zone manager.

• **Eugene Holman,** former vice-president, has been elected president, Standard Oil Co. of N. J. He succeeds **Ralph W. Gallagher,** who has been made chairman of the board.

• **George E. Egger** has been made assistant to J. Louis Reynolds, vice-president of the Reynolds Metals Co., Richmond, Va. Mr. Egger will assist in the direction of the Foil and Packaging Division.

• **Byron M. Bird** has joined the staff of The Jeffrey Mfg. Co., Columbus, Ohio, as technical consultant on coal preparation and ore dressing matters. Mr. Bird has served as supervising engineer in charge of the U. S. Bureau of Mines Experiment Stations at Seattle and Tuscaloosa. Since 1930 he has been a member of the research staff of the Battelle Memorial Institute in Columbus, Ohio.

OBITUARY...

• **Israel Smith,** 69, president of Smith Brothers Iron & Steel Co., Grand Rapids, Mich., died June 10.

• **B. H. Bristow Draper,** president of the Draper Corp., Hopedale, Mass., died June 4. He was 59 years old.

• **Morris D. Lloyd,** 80, manager of hardware warehouses for Beals, McCarthy & Rogers, Inc., Buffalo, died May 28.

• **Albert H. Armstrong,** 73, retired General Electric Co. engineer widely known for his work in railroad electrification, died May 31.

• **Lazare Barth,** copartner in the firm of Barth Smelting & Refining Works, Newark, N. J., died June 11, at the age of 46. He was also secretary of the Barth Smelting Co., New York.

• **William L. Belknap,** chairman of the board of the Belknap Mfg. Co., Bridgeport, Conn., died recently. He was 79 years old.

Fatigue Cracks . . . BY A. H. DIX

She Turned Up a Heretic

• • • With horror in her eyes, a young lady who types for one of the brains department's brigadiers told us that a friend of hers in the industry says this is not *his* favorite family journal, and that furthermore he could do with less bragging about it on this page. We welcome minority opinions and are always glad to spread them on the records, not because of an uncontrollable desire to be fair, but because we are afraid too much oil and too little vinegar will spoil our editorial salad.

Take, for instance, this dripping tablespoonful just poured on by a generous Chicagoan:

> Yours is a great and supremely useful distributor of modern thought as it relates to the production of wealth.

This is an uncomfortable ideal to live up to. If the members of the brains department get into the habit of asking themselves "Is this great?" or "Is it supremely useful?" every time they write anything, obviously they will become panicky and will produce little prose for our pages.

So we suggest they take the tribute in the skeptical manner of the widow whose astonishment over a funeral oration mounted to the point where she whispered to her son, "Tiptoe over to the coffin and see if that's your father he's talking about."

Prose Unembalmed

• • • If, perish forbid, the brains department should ever become obsessed with its own importance, it would get stuffy and such colorful phrases as these would disappear from our pages:

> The $26 million cast armor plant at East Chicago is to go down soon . . . as result of bobtailing the tank program.
>
> . . . various government departments are futilely beating their gums (over reconversion).

Aptronym

> F. Lock is an engineer at the Yale & Towne plant in Stamford, Conn.
>
> —*C. R. M.*

Mist Into Fog

• • • Searching for personal postwar light, we devour every line in your favorite family journal, but our vision of the future is still something less than 20-20. A couple of issues ago one captain of industry said:

> ". . . trying to ease out of governmental controls instead of abruptly terminating them after the war would only ease us into permanent controls that would enslave the nation . . ."

On the next page another equally important captain of industry countered with:

> ". . . immediate provision must be made to insure stable employment after cessation of hostilities . . ."

Thinking that our mental haze could be blown away by the high speed cerebral fans operating in Washington, we joined with two members of the brains department in attending an editorial conference at the Capital, and are now able to report that our confusion is gone and that bewilderment has taken its place. Our personal fog, we discovered, is consomme compared with the pea soup existing in the national hub.

A captain of industry now working for $1 a year spoke nostalgically of an early relinquishment of government controls, but with no conviction of its feasibility. The hypnotic head of one important government department, who disavowed the New Deal, assured us that business and government cannot be unscrambled and must work hand in glove hereafter if we are to hold our own with the other postwar powers. A U. S. Chamber of Commerce economist said that the onus of providing employment should not be placed on individual businesses, making the very sensible point that the success of any business depends on how *few* employees it can get along with, rather than how many.

Various speakers hinted of their astonishment in finding that, when offered the opportunity of flying solo, many businesses have recoiled in fright.

The founts from which we drank seemed to agree on one point — that somehow about 56 million jobs must be provided and that failure to approximate the assignment would have unpleasant consequences. Everyone said something should be done now, but no one offered a blueprint or even a rough sketch.

Postwar Ace in Hole

• • • The man from the U. S. Chamber of Commerce said, "*A free enterprise system is one in which free men show enterprise.*" As enterprise contains a considerable element of risk, the implication is that the system will run down if there is too much emphasis on safety.

We thought of our brains department's enterprise in tackling the task of combing over the enemy-owned patents taken over by the Alien Property Custodian, and preparing thumbnail descriptions of those covering metal products and processes. It was one of those undramatic, deadly dull jobs, and it might have laid an undersized, off-grade egg. But it didn't. The demand for reprints has obliged us to reprint the lists five times. The latest reprint (48 pages) contains the entire series of seized patent descriptions published serially in THE IRON AGE. We will break about even by supplying you with a copy for 30c in stamps or cash.

Desk Zoo

• • • The President has added to the collection of miniature porcelain animals he has on his desk. We counted about twenty-four, which is an increase of roughly 50 per cent over a year ago. But still no elephant.

Whitey Blows His Top

• • • Best known head of hair in the industry was owned by F. A. ("Whitey") Maurath, the welding electrode manufacturer. At metal and machinery conventions his blonde oriflamme, each individual hair standing at attention, made him distinguishable half the length of the hall.

But the famous hair is no more. When we first saw this photograph, we thought that someone had either done a clever retouching job or that "Whitey" had a hairless twin. But the picture is legitimate. Owner of the fine head of skin is the original "Whitey." The plowing under was occasioned by falling hair, but the shaved state is temporary. A new cover crop has already sprouted.

Puzzles

The answer to last week's wine problem is too long to give here. If you want a copy, we will send it to you.

Par for this is 90 seconds:

> For a backyard Sunday afternoon supper, A contributes 7 hamburgers and B 8. The total cost is 30c. C arrives unexpectedly and all share equally. C pays A 14c. and B 16c. B protests and the matter is referred to a referee. What is the correct division between A and B?

FAIRBANKS-MORSE CENTRIFUGAL PUMPS
A complete "family" of single-stage, split-case pumps for low, moderate, medium, and high heads, is described in Bulletin 5810D. Many other bulletins available on other types.

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Pumps

Dear Editor:

TRANSOM BUSINESS

Sir:

Will you please send us 250 reprints of your June 8 editorial, "Transom Business and Ten Per Centers." We would like to circulate it among our employees.

LOUIS POLK,
President

Sheffield Corp.,
Dayton, Ohio

CASTING VS. WELDING

Sir:

Your May 18 issue has an article by L. F. Williams of Cooper-Bessemer Corp., Mt. Vernon, Ohio, under the heading, "Cost of Meehanite Castings vs. Welded Structures."

I cannot allow the cost he shows on built-up structures from welding to go without challenge. The lowest cost he shows is 60c a pound; the highest cost he shows for welding is $2.63 a pound.

I can assure you the castings which he shows there could all be made for under 20c a pound, under normal manufacturing conditions, as an average, and I would be perfectly willing to take the job of producing these in the quantities which he is speaking of, of 20 a month, at one-quarter of the price that he shows; and if he will guarantee me the manufacture over a period of two years at that rate, we should be very glad indeed to help pay off the national debt at the same time.

J. F. LINCOLN,
President

Lincoln Electric Co.,
12818 Coit Road,
Cleveland, Ohio

● Mr. Lincoln's letter was forwarded to the author, whose answer appears below.—Ed.

The last paragraph of Mr. Lincoln's letter is ambiguous. He says the "castings" shown in the article under discussion "could all be made for under 20c. per pound, under normal manufacturing conditions, as an average. . . ." Of course, I don't know what "normal manufacturing conditions" are, or when, if ever, we shall see what Mr. Lincoln regards as "normal manufacturing conditions."

My article does make the point, however, that under the abnormal, wartime conditions which have prevailed for the past three years the parts shown were not only cast but cast *and machined* (as an average) for 20c. per pound, whereas the weldments cost "as an average" 68c. a pound.

Please extend to the overburdened taxpayers the assurance that Mr. Lincoln shall have an opportunity immediately to produce and machine the weldments for us at one-quarter of 68c. per pound or 17c. per pound "as an average."

L. F. WILLIAMS,
Assistant Secretary

Cooper-Bessemer Corp.,
Mt. Vernon, Ohio

GEAR ERROR MEASURER

Sir:

Would you please send me a copy of the article, "Measuring Errors in Involute Spur Gears," which appeared in your Mar. 23 issue. I am very much interested in this subject and especially in the very fine articles offered by your magazine.

E. HOLMAN

RCA Victor Division,
Quality Department,
Camden, N. J.

BERYLLIUM COPPER STRIP

Sir:

Please send us a copy of the article by H. G. Williams, "Predicting Spring Performance of Beryllium Copper Wire and Strip," in your July 8, 1943, issue.

B. PLANNER

Selectar Mfg. Corp.,
21-10 49th Ave.,
Long Island City, N. Y.

● Reprints can be obtained by communicating with Instrument Specialties Co., Inc., Little Falls, N. J., with which Mr. Williams is connected.—Ed.

TWO TEN-HOUR SHIFTS

Sir:

REFERENCE JUNE 1 ISSUE WOULD APPRECIATE WIRING US DETAILS YOU MAY HAVE REGARDING FIFTH PARAGRAPH OF "NEWS FRONT" CONCERNING TWO TEN HOUR SHIFTS CONTEMPLATED IN WEST COAST YARDS PARTICULARLY THE NAMES OF SHIPYARDS CONSIDERING THIS CHANGE AND PERSONS WE MIGHT CONTACT FOR FURTHER DETAILS.

R. C. FULLER,
Naval Architect

Jeffersonville Boat and Machine Co.,
Jeffersonville, Ind.

● Consolidated Steel at Wilmington, Los Angeles Harbor, inaugurated two ten-hour shifts starting June 12, first shift six morning to four-thirty afternoon and second ending two thirty morning. Believe designed to attract scarce electrical and pipe fitters by increasing take home wages to skilled workers and also utilize available leadermen and foremen to better advantage. Other yards considering. Contact Edward Bosley, Consolidated Steel Corporation, Maywood, Calif.—Ed.

SUPERSONIC

Sir:

I would like to have reprints of these two articles, "Ultrasonics—New Metallurgical Tool," page 48 of your May 15, 1941, issue, and "Sheet Fractures Detected with Supersonics," page 60 of your June 8, 1944, issue.

EARL M. ANGER

614 Spring St.,
Scottdale, Pa.

● Reprints were made of neither article but we are sending you tear sheets.—Ed.

WHIM AND WHAM

Sir:

Would it be possible to procure several copies of your timely editorial, "Rule by Whim and Wham," published in your May 11 issue. Several persons that have read it have asked if copies could be obtained for them.

CHARLES E. SCHREIDT,
Manager

Triumph Valve Mfg. Co.,
Mansfield, Ohio

SOLDIER SURVEY

Sir:

We understand that you have made a survey relative to soldiers' opinions on unions, job priorities, etc. Would it be possible for us to obtain a copy of this?

JOHN E. SHEPHERD,
Research Director

Esquire,
Madison at 46th St.,
New York 17

● See page 87 of our May 25 issue.—Ed.

NO-SPAT

Sir:

Where can I purchase No-Spat spatter proof liquid, mentioned on page 41 of your June 1 issue?

H. S. BLUMBERG,
Chief Metallurgist

M. W. Kellogg Co.,
Jersey City 3, N. J.

● From the Midland Paint & Varnish Co., 9115 Reno Ave., Cleveland.—Ed.

ATMOSPHERE ENRICHMENT

Sir:

Your Apr. 27 issue has an article on the enrichment of blast furnace atmospheres. This is an extract from a larger article printed in the "Archiv fur das Eisenhuttenwesen," and written by R. Durrer, Petro Lwowycz and Borut Marincek. Could we obtain a photostat of the original article or a copy of the above mentioned magazine?

F. G. KERRY,
Manager

Canadian Liquid Air Co., Ltd.,
Development & Engineering Dept.,
1111 Beaver Hall Hill,
Montreal, Canada

● We have no copy of the entire article but the Engineering Library, 29 W. 39th St., New York City, has that particular issue of the magazine. It also has photostatic facilities.—Ed.

ECONOMICAL BUYING

Sir:

Can I obtain a clipping of the article on pages 217 to 220 of your July 24, 1930, issue, "How Much Should One Buy To Get the Lowest Final Cost?" by Holloway Kilborn?

W. A. WALTER

Remington Arms Co., Inc.,
Bridgeport, Conn.

● We have no more copies, but will furnish photostats at cost. You might be able to obtain photostats from the Bridgeport Public Library as many of the larger libraries have a photostating service.—Ed.

GONG WARNING

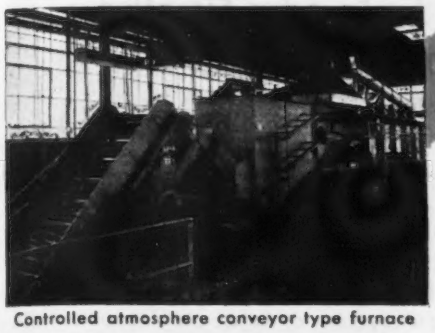
Sir:

We would like to get another clipping of the article by Harold Hague on page 77 of your May 11 issue which has to do with a weld comparer which warns the operator by means of a single stroke gong, whether the in-put of a resistance welder is within allowable limits.

EVERETT P. BALCH,
President

Orange Screen Co.,
515 Valley St.,
Maplewood, N. J.

5 REASONS WHY INDUSTRY LOOKS TO MUEHLHAUSEN FOR LARGE, HOT-COILED SPRINGS!



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This Industrial Week . . .

- **WPB Releases Blueprint for Civilian Production**
- **"Little Steel" Formula Endangered by Foundry Situation**
- **Steel Demand Increases as Output Tends to Decline**

HIGHLIGHTING developments industrial-wise this week was the WPB plan for reconversion to the production of essential civilian durable goods. The plan involves a list that details civilian products according to their relative urgency. The list is in three parts as regards the urgency of demand and the items are shown for three levels of supply.

The first level is the program which WPB is anxious to get into production as quickly as possible, since it represents the minimum rationing and replacement requirements. The second level figure represents the hoped-for production where rationing efforts slip. Level No. 3 is the optimum output demanded, taking into consideration prewar demand and the current estimated replacement needs. Procedures for manufacturers in working under the reconversion blue-print have been set up, but it is definitely understood that no production that will possibly conflict with war needs will be permitted.

While the critical situation eases on some products, such as aluminum and magnesium which were released for non-military production recently, other industrial phases and items, instead of easing with regards to supply, are tightening. Foundries are in this category. Production of castings has definitely fallen to the critical stage, and Washington is giving the problem its undivided attention. Regional offices of Washington agencies have been instructed to do everything in their power to increase the output of foundries.

THIS rush for castings brings up the question of wages. Washington instructions are expected to result in higher wages, even to the extent of breaking up the Little Steel formula; widespread and quickly attained facilities grants, and as much special consideration from Selective Service boards as possible.

Since Pearl Harbor, it is estimated that some 200 foundries out of about 2800 have closed up shop, cutting down output from about 15,500,000 tons in 1942 to slightly over 12,000,000 in 1943. The situation is said to be critical and efforts to help foundries to date have not been beneficial.

So far invasion activity has had little effect on steel requirements for the reason that it has been at peak levels for months. In the past week there has been no definite change in the volume of orders, which, with most companies, are running ahead of actual production. Backlogs continue to increase and the carryover situation has not been bettered to any extent. Practically all steel companies have heavy carryovers on plates and sheets, and within the near future carryovers are expected to mount on such items as large sized bars and semi-finished steel.

Concurrent with the increase in steel demand has been a slight decrease in total steel production. Some sources ascribe this to hot weather, others to the manpower situation, while still other analysts believe it is the combination of these two factors plus a rehabilitation and repair of machinery that has been running at top speed during the past two years.

ATTENTION in the flat rolled field is said to be focused upon WPB's move in cutting the warehouse loads in galvanized sheets. The Navy apparently must instigate the action because it has been having difficulty obtaining material for portable housing. The advance commitment of the mills in galvanized sheets may make it difficult, if not impossible, for the Navy to obtain much additional material for several months.

WPB this week pointed to the fact that ferrous scrap inventories were approaching the 4,000,000 ton low of a few years ago when steel production was curtailed for lack of that material. However, the current trends in the market indicate that there is no fear of any recurrence of curtailed steel operations. Steel mills are carefully watching their inventories in order to keep them at optimum but not excessive levels and on many scrap items dealers and brokers are having difficulty in disposal.

Prices on the better grades are holding quite firm, but the elimination of springboards and the cutting of the base prices on turnings, alloys, and other lighter grades is growing. Consumers normally placed periodic embargoes on scrap so as to work off excessive stocks, but recently these have been more frequent. Likewise, consumers are being extremely careful to insure that scrap is up to specifications.

Steel ingot operations this week rose half a point to 97.5 per cent of capacity. In Pittsburgh production increased half a point to 94 per cent and in Chicago output gained a full point to 101 per cent. Other increases were: Youngstown, up one and a half to 97.5; Philadelphia, up half a point to 98.5; Western District, up five to 95, and Cincinnati, up one to 94 per cent. Slight decreases occurred in Cleveland, down one to 94.5; Birmingham, down two to 97, and the Eastern District, down 12 to 78.5. Unchanged from last week are Buffalo at 106.5; Wheeling, 98; Detroit, 99, and St. Louis, 99.

• **STEEL STRIKE**—Some sources are beginning to speculate on whether or not there will be a steel strike in case the WLB would rule against the workers' demand for more money. That it will take a long time before the full WLB gets the case seems to be a good foregone conclusion. Some analysts think it will be late fall before a ruling is made by WLB. Phil Murray single handed turned back a move recently by some rank and filers who wanted to withdraw the union's no strike pledge. Perhaps the views of those workers are indicative of what would happen in case the wage case goes against the union.

• **HIGH COST IRON**—Lone Star Steel's only chick, a 1000 ton blast furnace with 61 coke ovens, now stands on the books of the government at a total cost of $23,788,986. The Daingerfield, Texas, stack if built in peacetime would have cost only about $10,000,000, according to the experts. The company just secured an additional loan of approximately $4,000,000 from DPC to take care of unexpected labor costs and other over-running expenses.

• **STEEL FOR SHIPS**—Records show that all but an insignificant portion of steel used in hulls of welded merchant vessels meets existing specifications for quality. In the few cases where steel has been shown to fall outside the specification requirements, this fact has not been determined to contribute to the ship failures. Investigations have been iniated to explore properties not now covered by specifications with a view to improvement of material performance.

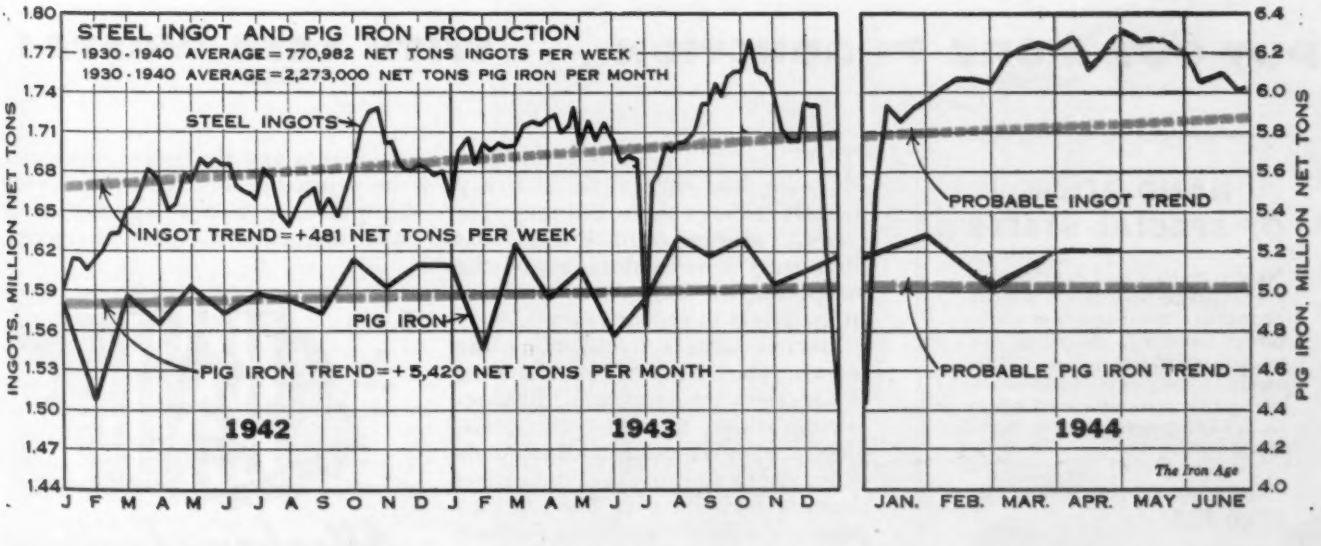
• **ELECTRODES**—There is no evidence that fractures in ships afloat have been caused by the inadequate quality of welding electrodes. Despite the pressure of the war emergency the quality and uniformity of welding electrodes have in general been maintained and, in some cases, improved through the cooperation of the producers. Investigations looking toward further improvement are being continued.

• **SPONGE IRON**—In contrast with the record time for construction of Republic's Gadsden, Ala., 1200-ton blast furnace which was authorized in October, 1941, and completed in May, 1942, is the company's experiment in "sponge" or "direct" iron at Warren, Ohio. The Gadsden furnace was completed 34 days ahead of schedule and only five months after the first material was brought to the site. The Warren plant was authorized in December, 1942, and is not expected to be in operation until September 15, 1944, which is just under two years' building time.

• **PAN-AMERICAN RELATIONS**—At the recent Pan-American Trade Conference in New York, South American countries urged that United States export restrictions be removed to permit the purchase of industrial equipment by South American countries. South American representatives pointed out that the warring nations have greatly expanded their industrial capacity, while South American countries have not. Complaining of a threat of inflation because of an excess of United States dollars, the South American delegates said that their countries were anxious to purchase United States industrial goods as a hedge against inflation.

• **TIRED WORKMEN**—Some steel workers have about reached the end of their rope on long tours of duty. One company claims that a fair percentage of its workers have been averaging as much as 16 hr. a day. The fatigue factor is becoming more serious and yet the manpower shortage in some lines of work is so great that it becomes necessary to work the men longer. How long this can be done is anyone's guess, but recent figures indicate the drop in efficiency is starting to offset the longer hours worked.

The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 15	93.5	100.0	96.0	98.0	95.5	106.5	93.0	99.0	99.0	90.0	93.0*	99.0	90.5	97.0
June 22	94.0	101.0	97.5	98.5	94.5	103.5	93.0	97.0	99.0	95.0	91.0	99.0	78.5	97.5

* Revised

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GENERAL OFFICES: BRACKENRIDGE, PENNA.

The Industrial Future of the West Coast

By CHARLES T. POST
Chicago Regional Editor

o o o

• • • **No appraisal** of the postwar possibilities of the West Coast can be complete without taking into account those political factors which have combined with military necessity to fertilize its war time growth.

Hard headed eastern industrialists find it hard to banish the concept that markets must germinate capital to produce the growth of productive facilities. From one standpoint this postulate has been exemplified in the growth of war time West Coast industry, for an assured market has existed for steel, aluminum, ships, aircraft, and many subsidiary items of war materiel. The existence of only one customer, Uncle Sam, and the reason for this desire and ability to buy, the war, might cause concern to many sales managers.

"What will happen to this market when peace comes?" is the usual cocksure query of orthodox business men, who infer that it will collapse immediately.

The overall West Coast situation varies from other geographical areas of the country in that it is far more heavily weighted than any other with government capital. Thus, the government is both customer and entrepreneur and there are very good reasons to believe that neither role will be immediately dropped like a hot potato.

As illustrated by the struggle of heavy industry through the depression, the normal desire to salvage insures continued operation when earnings are sufficient to provide payment of interest on investment. No one has such low interest as Uncle Sam.

Westerners who ride this train of thought are forced to shunt into a siding any thought of continuation of production of such purely wartime items as ships and planes on present schedules. But they hold the main line open for partial conversion of these big fabricating industries in such a way as to provide outlet for some raw materials, of which the Far West produced considerable even before the war brought the tremendous growth in light metals and steel.

At this point, sales managers usually grab the latest census to prove that there still aren't enough customers on the West Coast to handle its potential output and that a subsidy of some sort would be necessary to enable the Coast to sell in eastern markets. Well, why not? The power-rate pattern set for Bonneville, Grand Coulee, and Boulder Dams certainly was just such a subsidy. This policy could easily be extended by disposition of government owned plants in the Far West, by deliberate design, at a price far less than their original cost, while setting a higher price schedule for the eastern plants. Such reduction of overhead could go far to put a western manufacturer in competition with eastern producers.

Some individuals in the industrial East would probably cry to high heaven at such a thought. But with the present administration already committed to a policy of decentralizing production facilities westward, with a strong worker vote behind the New Deal, and with the alternative of four or five million persons without source of income in the three Coast states alone, such protests easily may be drowned out.

Even with conservative Republican legislative and executive control, the result might not be far different. The West likes candy and the 11 Western states still have 22 senatorial votes for trading purposes. Remember, the probable issue is not the pouring of large sums of good government money after bad to provide this subsidy, but merely, in effect, a general writing-down in value to salvage the original investment. And don't forget the humanitarian unemployment angle. Thus, we could arbitrarily place the chicken before the egg, production before markets.

SKY PATROLLING: *A Navy warplane soars high over Tanahmorah bay on New Guinea as landing craft streak for the beach far below. Meeting little opposition on the Pacific "D-day," the troops moved quickly inland.*

Fact Finding Committee Reports On Maritime Welded Ship Failures

Washington

• • • **The difficulties encountered** in the construction of all-welded steel ships and the causes of failures were investigated by a Board of Investigation Convened by Order of the Secretary of the Navy. This board, called to inquire into the design and methods of construction of welded steel merchant vessels, arrived at some important conclusions after examining a representative group of 2993 ships. The evidence revealed that attention must be given to detail design to minimize notch effects of square corners and other discontinuities. This has been recognized as good practice in riveted ship design. Record shows that all but an insignificant portion of the steel used in the hulls meets existing specifications for quality. Also, there was no evidence that fractures in ships afloat have been caused by the inadequate quality of welding electrodes.

On the basis of authenticated reports received on a representative group of 2993 ships, fractures have occurred after launching on about 577 occasions to 432 ships up to April 1, 1944. A large proportion of these were minor in character. In the case of about 95 ships the fractures were potentially serious in that they extended well into the ship girder. Twenty vessels have suffered complete fractures of the strength deck and, of these, five have completely broken into two pieces. Two of these complete fractures occurred on vessels still at the builders' yards prior to the vessel's being placed in service. Both of these vessels and one of the others which suffered a complete break after being in service have been repaired. Four of the vessels which suffered complete fractures of the strength deck but which had not been completely severed were abandoned so that only six vessels can be said to have been definitely lost to service from structural failures. No lives have been lost as the result of structural failures, except in the case of the John P. Gaines where 10 persons are missing after successfully embarking in a lifeboat. Cracking in ships afloat has usually been associated with near freezing temperatures, or heavy seas, or combinations of these two conditions.

New fractures continue to develop, but statistical data for ships afloat are insufficient as yet to indicate definitely the effect of corrective measures which have been taken. There is other evidence, however, that the incidence of fractures in new vessels while on the building ways has been materially reduced. The statistical analysis shows that practically all fractures originate in discontinuities occasioned by design details and notch effects incidental to imperfect welding. Contrary to popular impression, hull fractures are not confined to Liberty ships but are shared by other types of vessels.

The evidence so far revealed has shown that attention to detail design to minimize notch effects of square corners and other discontinuities which has been recognized as good practice in riveted ship design, is of even greater importance in the design of welded ships. Improvements in this direction are current in unfinished construction and in all new ship designs. Directives have been issued and progress is being made toward their accomplishment in ships in service. Research is in hand at government and university laboratories to explore the character of notch effect in order to guide the continued refinement of design.

Pending the accumulation of greater knowledge resulting from service experience and research as to the origin and propagation of cracks, careful consideration should be given in new welded ship designs to the provision of means for arresting the progression of cracks once started. In the case of the Liberty ships, directives have been issued for the installation of four longitudinal riveted joints in the strength deck through the midlength for this purpose. Work is progressing as rapidly as military considerations permit.

Records show that all but an insignificant portion of the steel used in the hulls of welded merchant vessels meets existing specifications for quality. In the few cases where steel has been shown to fall outside the specification requirements, this fact has not been determined to contribute to the fractures. Investigations have been initiated to explore properties not now covered by specifications with a view to improvement of material performance.

There is no evidence that fractures in ships afloat have been caused by the inadequate quality of welding electrodes. Despite the pressure of the war emergency the quality and uniformity of welding electrodes have

TRAFFIC DIRECTOR: ***A Coast Guardsman directs incoming LSTs to beaching positions with semaphore signals during invasion of the north shore of Dutch New Guinea. Capture of Wakde Island and Sarmi beachead after stiff Jap opposition brought Yanks two vital landing strips.***

in general been maintained and, in some cases, improved through the cooperation of the producers. Investigations looking toward further improvement are being continued.

Construction methods and quality of workmanship are major factors in the success or failure of welded hull structures. Some welded ships have sustained fractures while on the building ways whereas such fractures are not experienced with riveted hulls on the ways. This is accounted for in part by specific construction practices. In some cases similarity in the character and location of fractures in ships afloat to those which occur in ships on the ways has been observed, thus indirectly indicating faulty practices as a contributing cause of fracture. In other cases fractures in ships afloat have been directly attributable to faulty practices. Recognized good practice has been shown to reduce materially the number of fractures in ships while on the ways. The planning and execution of procedures and sequences for welded ship construction in conformance with recognized fundamentals of good practice is essential.

Adverse combinations of loading or ballasting, heavy seas and low temperature are factors contributing to structural distress. Of these factors only loading and ballasting are subject to control, course and speed being subject to only limited control while in convoy. Instructions have been issued in the case of Liberty ships, where the permanently installed arrangements for liquid ballast were not the most favorable, to insure a better distribution of ballast when conditions permit.

The following projects of inquiry have been initiated and are being pressed to the earliest possible conclusion:

1—Statistical analysis of steel mill products aimed at assisting the mills to obtain improved and uniform products. This subject is headed by the Bureau of Ships and contributed to by the mills, private and government laboratories.

2—Research to show the relationship between temperature and notch sensitivity in killed, semi-killed and rimming steels at the National Bureau of Standards.

3—"Study of the behavior of steel under conditions of multi-axial stress and the effect on this behavior of metallographic structure and chemical composition." National Defense Research Project No. NRC-77, which is being conducted by the Armour Research Foundation under the guidance of the War Metallurgy Committee (Navy Project No. NS-307).

4—"Behavior of steel under multi-axial stress and the effect of welding and temperature on this behavior." National Defense Research Council Project No. NRC-75, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-306).

5—"Residual stress in ship welding." National Defense Research Project No. NRC-64, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-304).

6—"History of residual stresses in welded ship hulls of the Liberty and oil tanker types." National Defense Research Project No. NRC-74, which is being conducted by the University of California under the guidance of the War Metallurgy Committee (Navy Project No. NS-305).

7—Experiments in strength of welding, which are being conducted by the Illinois Institute of Technology.

8—Photo-elastic study of various means of hatch corner reinforcement, which is being conducted by the David Taylor Model Basin.

9—Study of various types of crack arrestor by small scale models, conducted by David Taylor Model Basin.

10—Crack arrestor study with large models, which is being performed at the University of Illinois.

11—Weldability of steel for hull construction, NDRC No. NS-255 at Lehigh University.

Summarizing the findings of the board, it was shown that in 2561 of the 2993 large welded merchant vessels of the total Maritime Commission program in service up to April 1, 1944, no fractures subsequent to launching have been reported. In the remaining 432 ships, fractures which were potentially serious occurred in 95, of which six resulted in the loss of the vessel. Analysis of the fractures indicates the existence of phenomena in welded construction which may be of importance and to which a long and satisfactory experience of riveted construction affords no reliable guide. They include such factors as shrinkage stresses built into the hulls by the welding process, the behavior of steel at low temperatures and the stress strain characteristics inherent in the locally more rigid welded structure.

Basically, the abnormal conditions of wartime shipbuilding and ship operation, construction practices largely incidental to speed of production, and structural design details, are factors which in large measure have contributed to the occurrence of fractures. Appropriate steps have been taken to improve the two latter conditions where control is feasible but such corrective measures have not been in effect long enough to be able to state definitely at this time that they will prove completely effective.

In closing its preliminary report, the board considered it important to record its opinion that without early and general adoption of welded construction in the merchant shipbuilding program, as well as in the Naval shipbuilding program, the results in speed and volume of construction which have been accomplished would have been impossible.

HITTING THE BEACH: *An LST boat reaches the beach in the second wave of the invasion of Sarmi, Dutch New Guinea. Stretcher bearers plunge through the surf in the amphibious assault which resulted in the capture of Wakde Island and Sarmi.*

Warns That Cutbacks Do Not Mean Early Termination of War

Dayton, Ohio

• • • **An occasional contract** cancellation or cutback in aircraft and equipment for the Army Air Forces does not mean an early end of the war, according to Brig. Gen. O. R. Cook, chief, Production Division of the AAF Materiel Command, here, recently.

"The cancellation of contracts covering certain types of planes and equipment," said Gen. Cook, "merely means that the AAF are adequately equipped for the time being with the materiel in question. It takes a long time to produce the necessary quantities of equipment, involving some 500,000 different items, to supply an AAF of 2,500,000 men. But after two and one-half years of production effort unequalled in the world, obviously we are beginning to catch up with our needs for certain items."

The General explained that once the AAF are adequately supplied with a certain type of airplane, peak production on that type of plane is no longer necessary and all that is required is replacement of losses.

The same thing is true of all items of AAF equipment, he said, adding that no one should get the idea, because production can be cut back on certain items or stopped on others, any easing of the war effort is possible. "Manpower released by reduced production in some lines is greatly needed in others where adequate supplies of equipment have not yet been accumulated," he said.

However, along with Gen. Cook's statement comes an announcement from AAF Materiel Command Headquarters that a contract termination school has been opened at the Army Air Base, Vandalia, Ohio.

Hundreds of crack administrative officers for contract termination and property disposal assignments will take the month-long intensive course in the next few months.

The Materiel Command is responsible for the engineering, procurement, production and inspection of all AAF equipment. It has in effect approximately 11,000 contracts covering more than a half million items. The subcontracts are innumerable. The termination of contracts resulting from changed tactical and stragetic requirements is a job for highly trained experts.

Operating units which will handle the job will come from the new school and will be composed of contracting officers, negotiators, property disposal officers, legal officers and accountants.

According to Capt. C. B. Mahin, chief of the Training Branch, Termination Section, who is in charge of the school, only top flight business executives with established business reputations or successful corporation lawyers and bankers will be eligible for entrance into the course.

"Basic Steel" Panel Resumes Hearings

Washington

• • • **Resumption of the** CIO-USWA wage hearing before the "basic steel" panel of the WLB was begun on Tuesday with the presentation of individual steel company cases, led off by Hiland G. Batcheller, president of the Allegheny-Ludlum Steel Corp., who, frequently in caustic terms, assailed the demands as a threat to the economic health of the steel industry.

He pointed out that even assuming the figures used by the union in its brief were correct, they show that the most his company could recover under the carry-over provisions of the tax laws in the event of a loss in 1944 would be $1,871,000, a sum that would not be sufficient to pay three weeks' payroll of the company.

The steel case was resumed on the heels of a blast directed at WLB by the CIO.

Allegheny-Ludlum, said Mr. Batcheller, not only objects to the union demand that the existing contract be revised to permit deduction of dues in excess of the present $1 a month rate but has filed as a counter demand the following:

1—Elimination of maintenance of membership requirements from the contract.

2—Cancellation of check-off provisions for union dues and initiation fees.

3—Provisions for NLRB supervised elections at regular intervals to determine if employes wish the union to continue as collective bargaining agent.

4—Establishment of specific penalties for encouraging, aiding, or taking part in any strike, slow-down or work stoppage, these penalties to take the form of suspension or discharge. To supplement this, a statement is requested from the president of the USWA, signed by the officers of the local and local shop stewards, setting forth the no-strike pledge of the union in such form that it may be enlarged and posted on the bulletin boards at each plant.

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CLUSTER BOMBS: *A Yank loads this formidable array of 20-lb. cluster bombs into a Flying Fortress (B-17) bomber at an English air base. Developed by the AAF Materiel Command, clusters of these fragmentation bombs are used in all war theaters against ground troops and installations.*

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Cutbacks Indicate Light Plane Losses and High Level of Output

Pittsburgh

• • • **Probably the most** significant development from the standpoint of progress in war production that has occurred to date has been the cutbacks announced by the Army and Navy in production of aircraft. The Navy cancelled its contract with Brewster Aeronautical for "Corsairs" and the Army cut back its contracts with Bell Aircraft Corp. and Douglas Aircraft Co. The Navy cancellation resulted in a rather large scale layoff of workers, as did the Army cutback at Douglas. Bell, however, announced that layoffs would be practically negligible because of the cutback.

Also, just announced this week was the cancellation of the Army contract for 600 of the new Edward G. Budd "Conestoga" cargo ship that was just recently announced. Likewise, the Navy cutback its contract for this ship from about 200 planes to 25. As the plane has just completed tests, there have been only about four delivered to date.

The plant itself at Bustleton, Pa., near Philadelphia, will be used probably for the manufacture of high urgency shells for the Army. While this is not positive as yet, it is known that the Army has indicated willingness to put war work into the plant. It is expected to take from one to four months to complete the conversion of this plant to munitions manufacture.

Apparently plane losses have been fewer than originally anticipated for the operations now in progress. There is, however, a bit more to these contract terminations than just the low plane losses. As aircraft is the largest single war production program and since there have been no recent upward revisions in aircraft production goals, these terminations indicate that the airplane program is at or very near its peak and will level off from now on out to the end of the war. In fact, there may even occur a slight curtailment in plane production, but probably only in the number of planes produced. Tonnage produced will likely remain at its current peak because of the fact that the heaviest load of the air fighting remaining will likely be carried by the bomber squadrons, which call for the heavier planes. Production of the B-29, the new "super-bomber" that has been under construction for more than a year, may be speeded up by converting to this project operations of some of the plants that have suffered cutbacks.

While this ship has not as yet been known to make an appearance in any of the war theaters, it is far past the experimental stage and production is now a fact. There is the possibility that it has been used in one or more of the war theaters, but the fact has not yet been announced.

The B-29 super-bomber bombed Japan on June 15, according to a War Department announcement. This was the first mission revealed for the huge B-29s.

With the cutback in aircraft production, there were also some reverberations in other industries. Quite a few aluminum production lines have been shut down and more are expected to go down. Magnesium production at five or six plants has been cut back rather sharply since the first of the year. Of course, in most instances these cutbacks preceded the cutback in aircraft output, but that is only a natural situation. In fact, the cutback in aircraft production in some ways explains the reason for the previous cutbacks in production of these raw materials.

Unfilled Orders Continue Downward

New York

• • • **The National** Industrial Conference Board's index of manufacturers' unfilled orders continued the downward trend of the past four months, falling off from 804 in March to 789 in April and reaching its lowest point since April, 1942. Unfilled orders of both durable and nondurable goods declined, the former reaching its lowest point in the past two years.

The total value of inventories declined for the sixth successive month in April. Inventories of durable goods were down 1 per cent from March, while those of nondurable goods continued their decline begun last December, and were the lowest since October, 1941. The index of new orders moved up from 282 in March to 290 in April—a rise of 3 per cent. An increase of 15 per cent for durable goods accounted for the advance in the combined index, as bookings of nondurable goods decline.

Shipments of manufacturers gained 1 per cent in April over both the preceding month and a year earlier. The index rose to 281 in April, compared with 277 in both March, 1944, and April, 1943. Deliveries of durable goods increased 4 per cent over March, while nondurable goods showed an equal decline.

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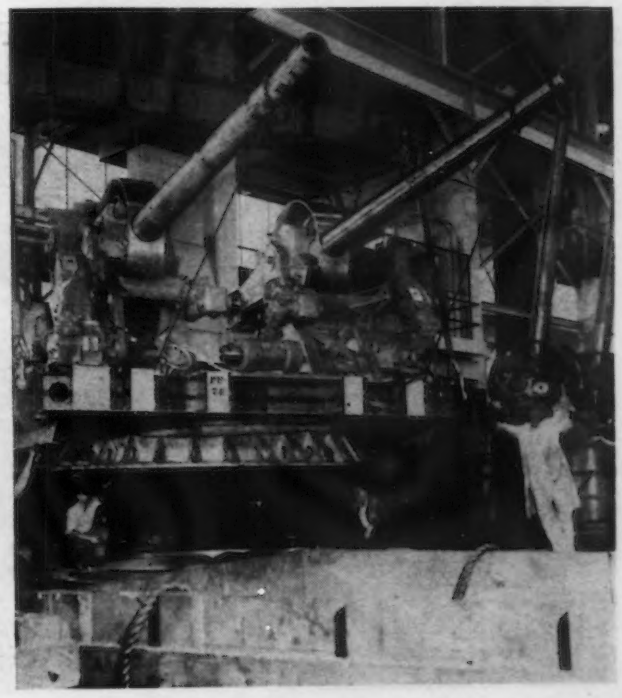

DEATH FOR AXIS: *This twin gun assembly swings into place at the U. S. Naval Ordnance Plant production line operated by the Westinghouse Electric & Mfg. Co., at Louisville, Ky. The two 5-in. guns are designed for both anti-aircraft and surface action.*

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Heavy Inventories Resulting From Cutbacks Do Not Violate CMP Rulings

Washington

• • • **Persons whose war** contracts are reduced or cancelled will not be in violation of inventory regulations merely because amounts of materials they hold after a cutback are in excess of a practicable minimum working inventory or, in the case of controlled materials, in excess of a 60-day supply. This explanation was given by WPB in interpretation No. 3 to CMP Regulation No. 2. Inventory rules, which are contained in Priorities Regulation No. 1 and CMP Regulation 2, are written to prevent persons from receiving any more deliveries of items of materials if their stocks of such items are in excess of the maximums permitted by these regulations.

Particular attention was called by WPB to the fact that the limitations are on an item basis. If a producer has in his stocks the maximum amount of an item of steel (not more than a 60-day supply) that he is permitted to have under the inventory regulations, he may not receive any more deliveries of that item until his stock is reduced to a point where a new delivery of that item would not result in an excessive stock. However, he is not prevented from accepting deliveries of other items of steel if such deliveries will not give him an excessive inventory of those particular items.

If materials are acquired within the restrictions of CMP Regulation 2 and Priorities Regulation 1, neither regulation prohibits the mere possession of an inventory. This is true even if a change in circumstances makes the amount greater than is permitted.

The interpretation also points out that CMP Regulation 2 does not affect the liability of a customer for material in either his inventory or his supplier's inventory, when his contract is cancelled. Such liability is controlled by the provisions of the contract between the two parties and by contract law.

Shell Program Gets Into Stride

Pittsburgh

• • • **Shell steel production** is on the upgrade. Specifications are being received now for third and fourth quarter shipments, and some shipments originally scheduled for early in the third quarter of 1944 will likely be made this month.

The effects of the shell program on the general metal working industry picture will be widespread. In the first place, the program will mount steadily until January 1, 1945, when it is planned that shell steel production will be about 150 per cent greater than the May, 1944, output. This, of course, includes the entire shell steel program, which is primarily for the Army. The Navy will get its requirements from this total.

In addition to tying up practically all the larger bar mills, these shell needs will also tie up a considerable part of the structural rolling capacity, where it is expected that much of the larger sizes will be rolled.

The normal monthly production directives of further processors of bars, especially in the large sizes, are expected to be cut because of the program. There will not be enough hot rolled bars to go into these shops, such as cold drawers, and it is expected that assigned tonnages to these fabricators will fall off.

Forge shops that are carrying work now scheduled for the future which is not related to the shell program will also likely find that this work is cut back to provide forging facilities and capacity to handle the shell work. There are many companies that are beginning to set up for shell work that have not had any such work prior to this time, but even with new facilities, capacity will be strained to the limit. For example, the Bustleton, Pa., plant of the Edward G. Budd Mfg. Co., where the new Freighter-cargo plane, the "Conestoga," is being built, will be converted over to the manufacture of shells as soon as the present Navy contract for airplanes is completed. The Navy cut back its "Conestoga" contract from 200 to 25 planes and the Army cancelled its contract with Budd for 600 of these ships. The Budd plant will be used for making shells for the Army.

SPEED UP PHONE: *Stuart Keiffer, crane operator, talks over a new communication system as he sits in crane high above a factory floor in Seattle. The system is used to direct cranes to jobs throughout plant.*

Mighty New Air Weapons Doom The Axis

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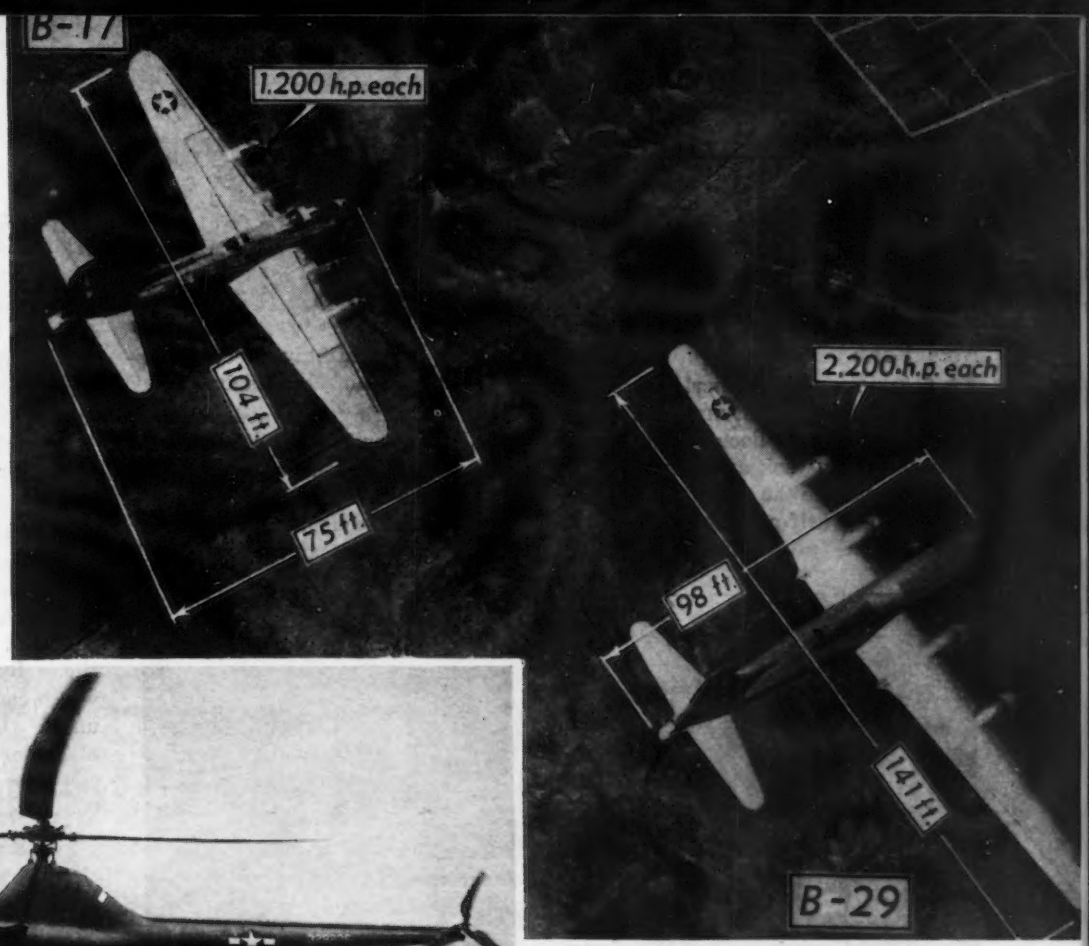


• • • The new Boeing Super Fortress (B-29) dwarfs its predecessor, the Flying Fortress (B-17) (upper right) . . . Above, a new XR-5 helicopter, built for the Army by the Sikorsky Co. It has been used in Italy for wounded evacuation from inaccesible front line spots. . . . Below, first photograph of a new, giant glider used in the invasion of Normandy. It is the largest ever built . . . At right, Gen. Eisenhower confers with Admiral Sir Bertram Ramsey (left) and Gen. Montgomery on the subject of Axis annihilation.

Secrets of New Artillery Type Rocket Projectile Revealed by U.S.

New York

• • • A group of reporters, summoned by telegram, sat around a large table on the 18th floor of the Yale Club here this week and were shown for the first time the mysterious, powder-burning, self-propelled artillery type rocket projectile which has proved so devastatingly effective during the invasion of Normandy.

Long a closely guarded military secret, the new weapon lay on a wooden brace in the center of the table as Chester M. McCreery, manager, Rocket Division, Revere Copper and Brass Inc., explained away much of the mystery and answered questions concerning hitherto unrevealed facts about the projectile.

Handsome, well-informed Mr. McCreery warned that a number of things about the rocket could not be told even now, two years after production started and after the weapon had been used by the Americans on all major fronts.

The rather innocent appearing object on the table has quite a history. It is light and adaptable, weighing less than 50 lb., but it has the potency and destructive force of a 105 mm. standard U. S. Army artillery projectile. By comparison, this weapon, which can be carried in batches of six under the wings of light pursuit planes or on the backs of parachutists can wipe out the same area as a 14,000 lb. 4.5-in. artillery piece.

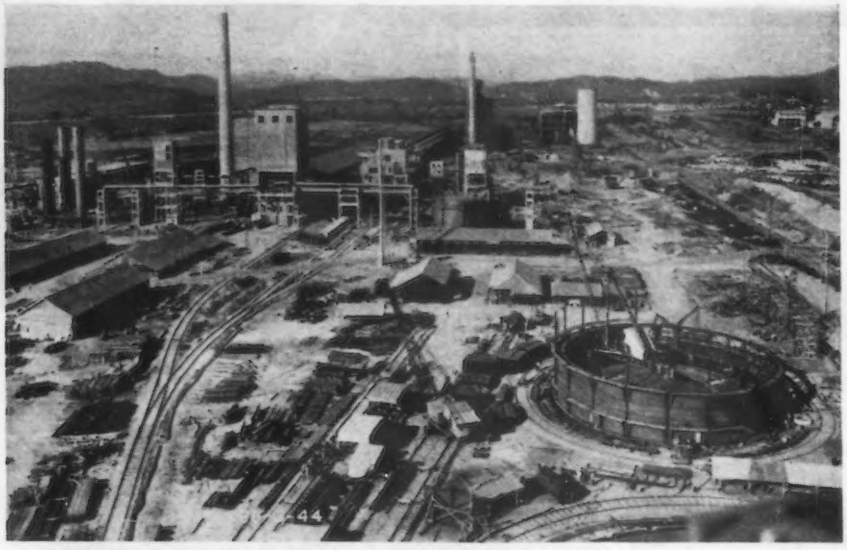
Operating under the same principle as the better known "Bazooka," the projectile can be fired from landing barges, tanks, PT boats, amphibious ducks, half-tracks, or from practically any place on the ground.

It is constructed of butt-weld tubing. Electric welding is used to seal the rocket. The manufacturing process is cheap, fast, with the tubing coming off the line at the rate of 40 ft. per min. A stenciled line on the projectile said "1,000,000th Rocket," which is simply a hint as to the large number of rockets already produced by the Revere concern and in use throughout the world.

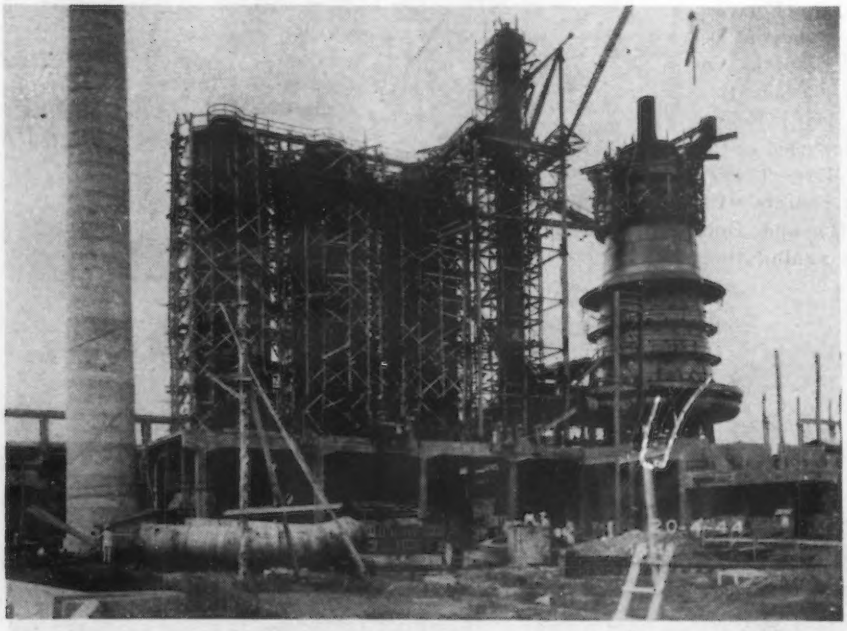
Mr. McCreery was prohibited by the War Department from giving the actual dimensions or the range of the projectile but admitted that the accuracy of the rocket left much to be desired.

Rockets are transported in almost any kind of hollow tube container which acts as part of the operation mechanism. Once the rocket is set up on a light tripod, the case is elevated to the desired range, aimed, and directed toward its target. Six of these projectiles fired simultaneously gives the concentrated fire power of a battery of conventional artillery.

Still a military secret is the kind of powder used in the rocket. The name given by the War Department is "propellant" powder which is adequately descriptive but evasive enough for the purposes of safety. The fuse also is a secret but the most secret of all is the ingenious directing device attached to the projectile.



SOUTH AMERICAN WAY: *Heavy industry is moving into Brazil with the erection of this sizeable Volta Redonda steel plant in Brazil. Expected to be completed by the middle of* 1945, *a town of* 10,000 *has already sprung up around this site.*



GOOD NEIGHBOR: *This* 1200 *ton American designed blast furnace and stoves will cast native Brazillian iron late this year. The furnace is part of the new Volta Redonda steel plant of the National Steel Co. of Brazil*

New Dust Treatment for Silicosis Reported to Be Highly Successful

• • • **Development of an aluminum** dust treatment as a prophylactic for silicosis appeared to have reached the stage where it can be considered successful. A series of reports released in Canada and the United States, based on about three years of medical laboratory work, points to the treatment as a preventive for silicosis and as a means of improvement in many cases.

The investigation into the field, which began more than three years ago, has been published by the Canadian Medical Association Journal. Other papers on the subject were recently read before the Canadian Institute of Mining and Metallurgy.

The basis of the inquiry was a medical theory that silica injures human tissue through a slow transformation into silicic acid in the presence of body fluid. Doctors D. W. Crombie and J. L. Blaisdell and G. MacPherson of the Queen Alexandra Sanatorium at London, Ont., hypothesised that if the solubility of silicious material could be reduced, fibrotic reaction would be modified or would not occur. As a means of reducing solubility it was discovered in 1936 that small amounts of aluminum powder constituted an inhibitor of merit, apparently due to reaction of the aluminum in coating the silica particle with a thin film.

Investigation in the Pittsburgh plant of the Aluminum Company of America established that aluminum powder in itself, breathed into the human system, produced no ill effects. The scene of the inquiry was then transferred to the McIntyre-Porcupine mines at Timmins, Ont. Of 360 silicotics in the Porcupine area, 102 were chosen as subjects for the experimentation, the others being rejected because of such reasons as age, complicating diseases, or over long times since exposure to the silica dust. Of these, treatment eventually began in 41 cases, and 34 completed the course.

Treatments were begun with a 5-min. inhalation of aluminum dust-laden powder daily, and this time cycle was increased 5 min. every few days until at the end of a month the patient received 30-min. periods daily. These were continued six days weekly to a total of 200 treatments. Of the 34 cases, 19 showed clincial improvement, evidenced by the lessening or disappearance of shortness of breath, cough, pain in the chest, and fatigue. The lessening of incidence of colds, and gains in weight were also observed in many cases. Fifteen cases remained stationary; but the doctors emphasized that these had continued their work in the mines and the fact that their condition had not progressed during employment in silica dust was considered significant.

The report of the three Queen Alexandra officials state that, "Aluminum dust cannot be regarded in any sense as a cure for silicosis insofar as restoring to normal lung tissue which has already undergone fibrotic changes concerned. Its use, however, would appear to be followed by beneficial results in a significant proportion of cases, chiefly in the amelioration of symptoms and in the increased capacity of work.

McIntyre Research, Ltd., which fostered the Canadian tests, also have undertaken investigations of aluminum therapy at Washington, Pa., where some subjects were employed in plants manufacturing silica brick, refractories and other products, while other men worked in foundries, sandblasters and quarrying which exposed them to silica dust.

Aluminum therapy on an initial test group of 33 men, it was reported by Dr. J. W. G. Hannon, medical director of the McIntyre project at Washington, resulted in improvement in all cases, decrease or disappearance of cough and shortness of breath, gain in weight, and improved lung ventilation.

A second series of tests was undertaken with 452 men. Of these 143 had positive X-ray lung findings and disabilities; 135 improved, two grew worse and six were unchanged. Of 104 with positive X-ray findings but denying disability, 93 improved and 11 were unimproved. A third group of 185 healthy men were treated and were expected not to develop silicosis, as a result.

$1,700,000 Benefits to G. E. Employees

Schenectady

• • • **Employees of General Electric** and its affiliated companies received benefits totaling approximately $1,700,000 during 1943 through the operation of Mutual Benefit Associations and of Group Sickness, Accident and Hospitalization plans. At the close of the past year more than 80 per cent of all eligible employees were participating.

As of Dec. 31, 1943, 166,701 employees were enrolled in these benefit plans, including 25,266 cases in which the wives and children of employees were also covered. A total of 21 mutual benefit associations have now been formed by the employees of General Electric and its affiliates, and the assets of these associations amount to over $1,100,000. At nearly every plant or office where mutual benefit associations have not been formed, employees are members of a Group Sickness, Accident and Hospitalization Benefit Plan. In addition, many employees also participate under local hospital benefit plans.

MAUD COMES THROUGH: *The Sea Mule, a powerful marine tug, built by the Ingalls Shipbuilding Corp., pushes a barge full of Army and Navy officers on her first test run, in the Pascagoula River. Her four engines churn out 572 hp.*

Outcome of Invasion to Decide OCR's Release of Civilian Goods

Washington

• • • **Not until the** Joint Chiefs of Staff decide that the invasion is a success will the pent-up consumer demand for items programmed by the Office of Civilian Requirements in its "Summary of Essential Civilian Durable Goods" released by WPB this week start on its way toward satisfaction by the beginnings of manufacture.

WPB's plan involves a list which details civilian products according to their relative urgency. This partial list is in two parts and is labeled "Most Serious Shortages," and "Serious Shortages."

TABLE I

Summary of Essential Civilian Durable Goods Programmed For Production

MOST SERIOUS SHORTAGES

Product	Unit of Measure	Quarterly Program Level 3	Level 2	Level 1	Production (Estimated) 3rd Quarter
Mechanical refrigerators	Unit	1,226,250	250,000	12,500	0
Sewing machines	Unit	210,000	80,000	.....	0
Vacuum cleaners, domestic	Unit	648,425	125,000	.....	0
Electric ranges	Unit	261,000	75,000	33,294	11,375
Com'l appliances, electric, not cooking or heating	$	1,755,000	N.A.	702,000	400,000
Elec. fans, dom. & com'l	Unit	700,000	234,370	10,000	10,000
Vacuum cleaners, industrial	Unit	4,500	1,500	900	500
Office machinery: Typewriters	Unit	91,000	60,000	36,000	2,000
Laundry & dry cleaning machinery, commercial	$ (000)	8,500	6,000	2,000	2,885
Washing machines	Unit	725,000	350,000	225,000	0
Ironing machines	Unit	82,500	42,000	.....	0
Floor finishing & maintenance machinery	Unit	3,100	1,250	300	300
Refrigeration, air conditioning, etc.: Water coolers	Unit	19,000	N.A.	9,000	0
Walk-in coolers	Unit	2,760	N.A.	920	0
Evaporative coolers	Unit	100,000	N.A.	35,000	0
Dairy refrigerators	Unit	4,020	N.A.	1,340	0
Display cases	Unit	22,800	N.A.	7,600	0
Dough retarders	Unit	1,800	N.A.	600	0
Reach-in coolers	Unit	8,580	N.A.	2,860	0
Portable electric lamp shades	Unit	40,500,000	7,925,000	.....	0
Portable electric lamps	Unit	8,500,000	4,250,000	.....	0
Motion picture (35 mm.) equipment	Unit	4,394	3,625	4,221	1,290
Bathtubs	Unit	100,000	35,000	9,000	7,555
Plumbing fixture fittings & trim	.000 lbs. metal	8,069	8,069	8,069	3,476
Gas hot plates	Unit	35,000	35,000	.....	11,500
Oil ranges	Unit	123,000	110,000	N.A.	50,000
Coal & wood stoves (sheet metal) with grates, etc.	Unit	40,000	30,000	N.A.	12,000
Fuel oil stoves, portable	Unit	210,000	100,000	30,000	40,000
Oil-fired floor furnaces	Unit	5,637	2,750	.....	0
Class B oil burners	Unit	69,145	30,042	12,335	0
Class B stokers	Unit	75,000	37,500	.....	0
Electric water heaters	Unit	45,000	30,000	12,500	6,500
Snow shovels	Unit	972,000	508,800	.....	0
Furnace scoops	Unit	371,200	480,000	.....	0
Steel tray wheelbarrows	Unit	150,000	100,000	83,000	31,500
Steel wheelbarrow trays	Unit	50,000	50,000	42,000	0
Hand hair clippers, domestic electric	Unit	271,400	108,600	.....	N.A.
Hand hair clippers, commercial	Unit	61,200	N.A.	21,250	N.A.
Wrist and pocket watches	Unit	4,019,300	2,375,000	.....	N.A.
Cases for imported watch movements	Unit	1,000,000	950,000	.....	N.A.
Carpet sweepers	Unit	488,000	375,000	.....	100,000
Mop wringers, commercial	Unit	62,500	31,250	.....	0
Roasters, black steel	Unit	250,000	250,000	.....	17,500
Stainless steel cooking utensils, commercial	Unit	N.A.	57,000	.....	0
Stainless steel cooking utensils, domestic	Unit	N.A.	260,000	.....	0
Firesets	Unit	130,000	46,000	N.A.	10,200
Grates	Unit	211,675	130,425	N.A.	8,100
Fireplace screens	Unit	189,000	103,500	N.A.	12,300

TABLE II

Summary of Essential Civilian Durable Goods Programmed For Production

SERIOUS SHORTAGES

Product	Unit of Measure	Quarterly Program Level 3	Level 2	Level 1	Production (Estimated) 3rd Quarter
Bicycles	Unit	753,405	150,000	75,000	75,000
Commercial cooking and heating appliances, electric	$	690,000	N.A.	276,000	150,000
Office machinery (except typewriters	$(000)	13,900	10,465	3,200	9,700
Scales and balances	$(000)	4,600	2,000	1,000	1,600
Commercial dishwashers	Unit	N.A.	N.A.	1,604	1,604
Ice refrigerators	Unit	150,000	150,000	.....	100,000
Flashlight cases	Unit	6,250,000	2,175,000	.....	500,000
Nursery seats & chairs	Unit	208,300	208,300	.....	.....
Play pens	Unit	138,800	138,800	.....	.....
High chairs	Unit	205,500	205,500	.....	.....
Chiffarobes, baby	Unit	31,900	31,900	.....	.....
Baby baths	Unit	111,100	111,100	.....	75,000
Cribs	Unit	225,000	225,000	.....	.....
Wood furniture, other than nursery furniture	$	250,360,000	158,287,500	.....	N.A.
Scullery sinks	Unit	7,100	7,100	7,100	6,000
Shower stalls	Unit	4,000	4,000	4,000	3,750
Cast iron boilers	Unit	26,000	26,000	26,000	21,000
Cast iron radiation	sq. ft.	1,750,000	1,750,000	1,750,000	1,225,000
Gas ranges & cook stoves	Unit	483,000	250,000	125,000	170,000
Coal & wood ranges & cook stoves	Unit	168,000	150,000	100,000	100,000
Oil cook stoves	Unit	82,000	70,000	N.A.	35,000
Oil table stoves	Unit	88,000	57,000	N.A.	50,000
Combination ranges	Unit	46,900	25,000	5,000	23,000
Portable and drum ovens	Unit	138,000	125,000	75,000	120,000
Bakers, non-electric	Unit	N.A.	N.A.	305	305
Broilers, non-electric	Unit	N.A.	N.A.	371	371
Fryers, non-electric	Unit	N.A.	N.A.	1,312	1,312
Griddles, non-electric	Unit	N.A.	N.A.	1,350	1,350
Hot plates, non-electric	Unit	N.A.	N.A.	548	548
Ovens, non-electric	Unit	N.A.	N.A.	598	598
Ranges, non-electric	Unit	N.A.	N.A.	4,710	4,730
Roasters, non-electric	Unit	N.A.	N.A.	49	49
Toasters, non-electric	Unit	N.A.	N.A.	150	150
Steam cookers & vegetable steamers, non-electric	Unit	N.A.	N.A.	698	698
Steam tables, non-electric	Unit	N.A.	N.A.	1,428	1,428
Coffee brewers, non-electric	Unit	N.A.	N.A.	80	80
Warmers, non-electric	Unit	N.A.	N.A.	63	63
Steam kettles, non-electric	Unit	N.A.	N.A.	635	635
Urns, non-electric	Unit	N.A.	N.A.	3,510	3,510
Food serving and preparation fixtures & equipment	$	N.A.	1,500,000	.....	N.A.
Gas radiant & bathroom heaters	Unit	247,000	125,000	105,000	100,000
Gas circulating heaters	Unit	124,000	65,000	20,000	52,000
Gas floor furnaces	Unit	47,500	20,000	7,500	10,000
Schoolroom stoves	Unit	400	300	N.A.	160
Laundry stoves	Unit	28,000	28,000	28,000	26,000
Fuel oil stoves, other than portable	Unit	105,000	50,000	5,000	40,000
Warm air distribution equipment S.T. Carbon Steel		25,000	18,000	11,000	13,530
Furnaces, warm air (cast iron and steel)	Unit	55,000	55,000	40,000	42,000
Class A stokers	Unit	6,550	6,550	6,550	4,549
Low pressure steam and hot water heating specialties	.000 Lbs. metal	2,947	2,947	2,947	2,326
Gas sidearm water heaters	Unit	75,000	75,000	75,000	71,000
Underfired water heaters	Unit	165,000	165,000	165,000	156,420
Coal-fired water heaters	Unit	96,000	96,000	96,000	91,000

Funds Urged for Postwar Planning

Cleveland

• • • **The city of Cleveland's** postwar planning council recommended last week that the city and other municipalities in the country immediately set up a fund to speed designing and preliminary engineering work on projects to be launched immediately after the war. Fear was expressed that unless detailed blueprints of worthwhile projects were ready, postwar employment by the city might consist of little better than leaf-raking.

The city's planning commission reports $60,000,000 worth of projects listed for the 10 years following the war but states that detailed plans for only about 18 per cent of these projects have been made. Reason to take postwar planning out of the theory status is now seen here in the current progress of the war.

Tool and Die Vacation Pay Plan Approved

Detroit

• • • **Vacation pay** allowances for tool and die industry workers have been approved by the Michigan Regional War Labor Board. The allowances also partially apply to workers in the cutting tool industry, the basis being as follows:

Workers of six months' tenure, 20 hours' pay; one-year workers, 48 hours' pay; 18-month workers, 72 hours' pay; two years or more, 96 hours' pay.

Cutting tool vacations vary in classifications over one year's service. Employees with two years of service get 72 hours' pay, and those with three years or more get 96 hours' pay.

The schedules are not compulsory and will apply only when management and labor jointly ask for approval.

Continental Can Plans For Veterans' Full Reinstatement

• • • **Setting in** motion a comprehensive program for veterans' reinstatement, Carle C. Conway, president and chairman of the board of Continental Can Co., Inc., recently sent letters to approximately 3700 employees in the armed services asking them to fill out and return an enclosed questionnaire. This covered such points as general and special training that employees have received since they entered military service, their present responsibilities and what job or jobs they think they would be suited for after the war.

Another part of the program provides an opportunity for employees now absent in military service to "catch up" with promotions that they may have missed by informing them of job advancements that they have missed, and by giving them a reasonable opportunity, including full-time instruction if necessary, to qualify them for the next vacancy that occurs.

In the same spirit, plans will be made in advance to put veterans returning with any one of nine disabilities into the kinds of work that they can do safely and well.

Steel Drum Group Discusses Postwar Surplus Liquidation

Washington

• • • **A WPB statement** issued last week said that methods by which used shipping drums may be more fully utilized, and means of disposal of possible future shipping drum surplus, will be the principal topics to engage the newly formed Reconditioned Steel Drum Industry Advisory Committee. The committee recently held its first meeting and engaged in preliminary discussion of problems to be faced during the postwar period of surplus liquidation.

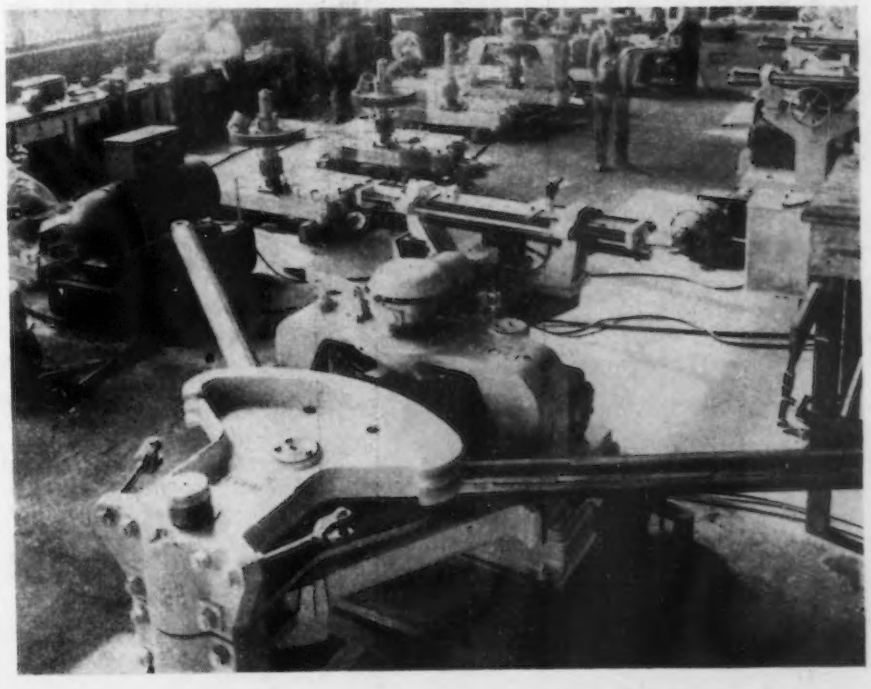
Canada Acts to Stop Misuse Of U. S. Preference Ratings

Ottawa

• • • **To prevent** anyone from using a United States priority on materials and supplies to which he is not entitled, a new order prohibits the use of a U. S. preference rating unless such use has been authorized by general order or by specific written authorization from the Priorities Officer, the Department of Munitions and Supply announced.

Because the destruction or disappearance of records always has gone hand in hand with a misuse of ratings, the new order requires any person who uses a U. S. preference rating to keep a record of his authority for each use, and a record of the use. Purchase orders, or copies of purchase orders, plus the authorization of the Priorities Officer or the Controller or Administrator acting for him, will normally constitute the required records.

LST STEERING GEAR: *At the stern of every Navy LST is a rugged, ingenious quadrant steering gear designed and built by Baldwin Southwark Division of the Baldwin Locomotive Works. Standard Steel and Cramp, two other Baldwin divisions, contributed castings and forgings which went into the construction of these gears.*



Decries That Bad Publicity Hinders Forge and Foundry Production

Cleveland

• • • **"If you want to help** us, stop this bad publicity," W. L. Seelbach, president of the Gray Iron Founders Society told the meeting of forge and foundry executives called here on June 14 by WPB to discuss the new program to lift production of foundry and forge shops. WPB deputy vice chairman of production, W. B. Murphy, and Forging and Castings Branch chief, George F. Hocker, who had already talked, were somewhat taken back by Mr. Seelbach's statement.

It was admitted by the Washington officials that much bad publicity had been released describing the forge and foundry trades as dirty, hot, and generally undesirable. This type of description was charged by Mr. Seelbach as being a major cause for the poor recruitment record of the industries although he stated that he was speaking only for the gray iron foundries.

The Army and Navy joined Donald M. Nelson and Paul V. McNutt in stating that the casting and forging labor shortages were the No. 1 problem of the present. The current shortage of LST boats has been caused by the shortage of cast blocks and heads for the engines, and heavy trucks are behind schedule for the same reason, Mr. Murphy stated.

The malleable industry is expected to be as much as 20 per cent below the volume of a year ago during June and July unless corrective measures immediately can be instituted. Steps in this direction are in the new program which is being submitted to all foundry and forge shops and all field offices of government agencies working with these shops.

Since labor is one of the primary deficits of the industries, the War Labor Board has been ordered to give immediate expedited treatment to some 2000 foundry and forge cases some of which have been pending before it for more than a year. A promise from WLB to clear the dockets of these cases by mid-July is said to have been received. Mr. Murphy stated in this regard that the greatest difficulty in both types of shop was wage inequities and in some cases the low starting wages. Both of these are expected to be rectified by the WLB's actions, he said, but general wage increases are not expected. Forge shops and foundries have the greatest number of cases before WLB of any industries on record, it was revealed.

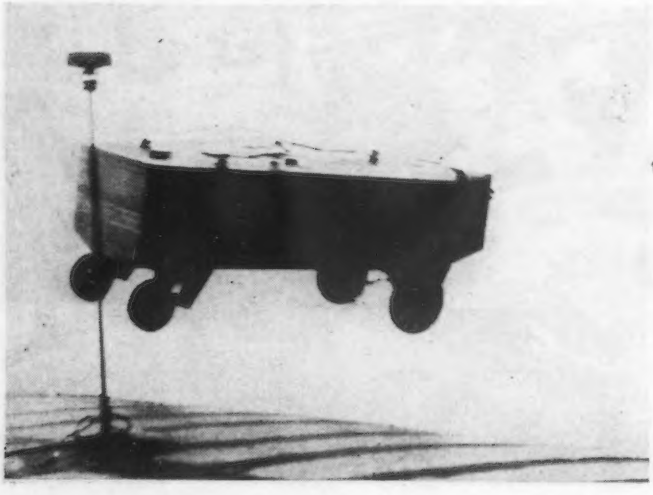
Recruiting of labor for both forge and foundry shops was cited as the keynote of the problem's solution. Both industries, which incidentally are considered almost as one in this regard, are to be given top labor priorities when the new manpower plan goes into effect July 1. Top urgency programs of the war dictate that forge and foundry production must be increased by 10 per cent by August, it was said. Some indication that certain casting and forging specifications might be lowered slightly to reduce rejections was hinted. More understanding, and possibly more liberal, inspection was suggested rather broadly.

Mr. Murphy also said that the WPB would make every effort to release all needed equipment for forges and foundries which would step up production. The formal limitations, however, will still apply. Cases pending before any other branch of government including OPA will also be put on the expedition list if settlement will aid production.

A new, strict scheduling procedure for malleable castings and forgings may soon be forthcoming from the Program Committee of WPB if current pressure will do any good, it was stated. Citing an example, Mr. Murphy said there were instances where a forge shop might have a farm implement part order dated in September with an AA-1 rating (out of that industry's top rating quota) and another truly urgent heavy truck part order with the same rating but dated later. The firms under present regulations would be forced to produce the farm implement order first. A directive to circumvent this priority regulation was predicted.

George Hocker, chief of the Foundry and Forge Branch, presented figures indicating that wages in the industries were not sub-standard. For February, he quoted average hourly wage rates of 103.0c. for all industries, 106.9c. for steel, 105.6c. for gray iron foundries, 104.0c. for malleable foundries, 109.0c. for steel foundries, and 123.0c. for forge shops. Low starting rates and wage inequities were charged with doing more damage in the industires than sub-standard wages.

Turnover was also cited by Mr. Hocker as not being excessive which was construed to mean that working conditions were not as bad as pictured by some publicity. Turnover for March in iron and steel was quoted at 5.34, gray iron foundries at 8.64, malleable foundries 6.02, steel foundries 7.35 as contrasted with turnover of as much as 14.60 in aluminum and 12.65 in the shipbuilding industries. Mr. Hocker said that the worse turnover occurred in common labor and that whenever there is a labor shortage turnover registers greater damage.



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FLYING FLOSSIE: *This curious steel water tank on wheels goes into her act to test aircraft catapults on British warships. This strange craft is used to launch "live" aircraft and can be filled with water to desired weight to meet launching conditions.*

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Girdler Urges "Honorable Discharge" Of Industry from Wartime Regulations

Cleveland

• • • **The "honorable discharge"** of industry from wartime regulations as soon as the war ends, was urged by T. M. Girdler, chairman, Republic Steel Corp. and Consolidated Vultee Aircraft Corp., in a talk delivered recently before the Chamber of Commerce, here.

Mr. Girdler pointed out that industry's first postwar problem is a speedy, orderly conversion from wartime to peacetime production. Already approximately 25,000 prime contracts, valued at 17 billions, have been terminated—four times more than all contracts cancelled following World War I.

The removal of superfluous wartime restrictions on industry is the No. 2 peacetime requirement.

"I am convinced that if these wartime restrictions," he said, "are held over to meet the conversion crisis, there is real danger that they will be required later to meet other crises, and still others, on and on into perpetuity.

There is a growing resentment, the steel executive told his audience, against certain union activities, because of the shameful record of strikes and work stoppages in war plants and because of un-American influence in some unions and the "all too frequent exposure of racketeering among union leaders."

He pointed out that early in the war leaders of labor organizations made a solemn "no strike" pledge. He quoted Dr. John Steelman, director of the Labor Department's Conciliation Service, as reporting that his service handled 3482 labor disputes in the fiscal year 1940-41; 5807 in 1941-42; 11,158 in 1942-43, and 22,000 disputes in the first 11 months of the current fiscal year.

Though these are some of the disturbing factors in the postwar outlook for labor relations, Mr. Girdler said "the growth of labor organizations in itself is not disturbing. Collective bargaining is necessary in modern industry. It is here to stay in one form or another. No enlightened employer would want to see it scrapped. But collective bargaining by government edict at the point of the bayonet ceases to be collective bargaining.

"There are still other evidences of failure on the part of unions to cooperate with the government during the war. Even now the steelworkers' union is engaged in an all-out effort to break down the government's stabilization policy. In its case before the steel panel of the War Labor Board, the union is seeking the destruction of the 'Little Steel Formula.' Such an event would let loose the pent-up forces of wage and price inflation, with serious consequences for the nation.

"Airport development is important because we are going to have greatly increased air travel when this war is over.

"At Consolidated, for instance, a ship is being built that will carry 400 soldiers, fully equipped, or 200 passengers, surrounded by every luxury. The Cleveland airport must be able to handle ships of this size, because Cleveland is admirably located to serve as a port for European flights.

"I only hope, however, that the improvement of our present port will not discourage the possibility of a closer-in airport, more accessible to the center of the city, which can be used for loading and unloading passengers only."

In discussing industry war profits, Mr. Girdler said that in 1943 50 leading manufacturers of war materials had 150 per cent increase in business volume over 1942, but a 14 per cent decrease in net earnings.

More By-product Ovens Started

Washington

• • • **During April** 110 new by-product ovens were put into operation, adding 1420 tons to the daily coking capacity of the industry, according to the U. S. Bureau of Mines. Stocks of by-product coke at producers' plants increased 62,874 tons during April and on May 1 were equivalent to 3.7 days' production at the April rate. Stocks of coking coal at by-product plants decreased 344,267 tons during April and amounted to 5,937,033 tons on May 1, sufficient for 22.5 days' requirements at the rate of consumption prevailing in April.

The production of both by-product and beehive coke in the United States for the month of April, amounted to 6,176,483 net tons. This was a decrease of 167,741 tons when compared with the output in March. The average daily rate of production increased from 204,652 tons in March to 205,883 tons in April, a net gain of 1231 tons.

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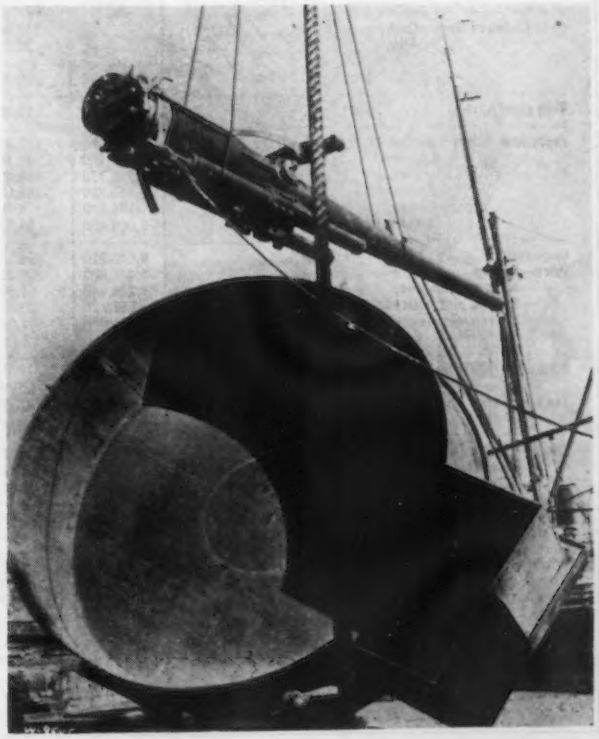

ALL-WELDED PLATFORM: *An anti-submarine gun is suspended above this all-welded gun platform at Lincoln Electric Co., Cleveland. The platform is typical example of the many essential arc welded steel fabricated items.*

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Renegotiation Speed-Up Discussed

Cleveland

• • • **Assurance that war contractors who have lowered production costs through actual increased efficiency will receive better treatment during renegotiation of 1943 profit was given by Col. Maurice Hirsch, vice-chairman of the War Department Price Adjustment Board speaking before a Chamber of Commerce sponsored audience of 300 Cleveland war plant representatives here.**

Col. Hirsch said an increase in overall volume naturally brings reduction in costs and an increase in profits. To the extent that the unit increase in profit results solely from increase in volume, the contractor is not entitled to any favorable consideration for cost efficiency, Col. Hirsch said. Careful attention, however, will be given in renegotiation to the cause of the increased profits. Where it is clearly shown that the contractor's operating efficiency has actually brought about lower costs, it will be a substantial element of more favorable consideration in renegotiated settlement. Col. Hirsch emphasized, however, that efficiency must be established and that the burden of proving increased efficiency fell upon the contractor solely.

Regarding government owned war plants Col. Hirsch said contractors in such plants were practically managers for the government and as such were not entitled to the amount of profit they would be if they risked their own capital. Col. Hirsch asserted that renegotiation was beyond the controversial status and that the conclusions reached in most proceedings had been just and fair.

American Iron and Steel Institute Capacity, Production and Shipments

STEEL PRODUCTS	Maximum Annual Capacity, Net Tons	APRIL, 1944 Production Net Tons	APRIL, 1944 Production Per Cent of Capacity	APRIL, 1944 Shipments (Net Tons) Total	APRIL, 1944 Shipments (Net Tons) To Members of the Industry for Conversion into Further Finished Products	TO DATE THIS YEAR Production Net Tons	TO DATE THIS YEAR Production Per Cent of Capacity	TO DATE THIS YEAR Shipments (Net Tons) Total	TO DATE THIS YEAR Shipments (Net Tons) To Members of the Industry for Conversion into Further Finished Products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.				703,547	218,984			2,833,452	868,491
Structural shapes (heavy)	8,977,450	327,883	45.8	319,038		1,402,319	47.9	1,366,590	
Steel piling		9,431		9,961		18,836		19,237	
Plates (sheared and universal)	15,990,020	1,150,643	87.7	1,129,750	56,407	4,708,385	89.0	4,587,621	180,052
Skelp				69,022	55,630			288,238	225,720
Rails—Standard (over 60 lb.)	3,625,000	181,901	61.1	176,975		778,115	64.9	769,950	
—All other	518,600	20,921	49.2	19,689		63,268	36.9	65,203	
Splice bars and tie plates	1,703,700	66,678	47.7	71,564		271,255	48.1	278,508	
Track spikes	373,200	12,793	41.8	14,448		48,969	39.7	52,010	
Hot Rolled Bars—Carbon		699,023		585,289	76,969	2,942,287		2,473,441	321,113
—Reinforcing—New billet		35,485		40,989		145,734		153,740	
—Rerolled		7,784		9,236		33,070		38,132	
—Alloy		259,808		190,044	40,325	1,098,224		800,781	150,965
TOTAL	21,207,210	1,002,100	57.6	825,558	117,294	4,219,315	60.2	3,466,094	472,078
Cold Finished Bars—Carbon		153,682		148,640		618,045		609,817	
—Alloy		32,216		27,770		142,183		125,544	
TOTAL	2,694,110	185,898	84.1	176,410		760,228	85.3	735,361	
Tool steel bars	214,970	11,276	63.9	10,742		48,818	68.7	46,061	
Pipes and Tubes—Butt weld	2,289,130	112,326	59.8	117,976		480,185	63.4	465,431	
—Lap weld	967,900	45,163	56.9	50,152		200,471	62.6	198,586	
Electric weld	1,225,170	68,427	68.1	67,840		233,398	57.6	232,102	
—Seamless	2,659,250	182,685	83.7	185,677		787,050	89.5	775,654	
—Conduit	184,500	4,706	31.1	5,391		16,815	27.6	17,216	
—Mechanical tubing	1,004,450	65,977	80.0	68,970		280,490	84.4	288,445	
Wire rods	6,840,210	354,568	63.2	105,229	26,816	1,471,368	65.0	415,481	112,428
Wire—Drawn	5,468,830	286,622	63.9	163,379	4,084	1,192,865	66.0	668,870	16,624
—Nails and staples	1,224,880	53,805	53.5	51,934		237,552	58.6	231,037	
—Barbed and twisted	551,720	20,537	45.4	19,761		85,082	46.6	83,326	
—Woven wire fence	1,101,090	31,049	34.4	30,431		128,137	35.2	127,752	
—Bale ties	150,660	6,664	53.9	6,894		27,758	55.7	26,136	
Black Plate—Ordinary				42,379	55			146,324	616
—Chemically treated	464,000	13,708	36.0	12,769		58,076	37.8	55,022	
Tin and Terne Plate—Hot dipped	3,452,400	140,318	49.5	157,758		540,479	47.3	602,784	
—Electrolytic	1,780,450	62,140	42.5	58,274		200,764	34.1	186,781	
Sheets—Hot rolled	19,611,270	1,014,579	63.0	520,318	26,010	4,134,072	63.7	2,136,055	89,238
—Cold rolled	7,318,780	299,496	49.9	172,209		1,183,593	48.9	665,795	
—Galvanized	2,686,410	99,814	45.3	101,589		406,559	45.8	404,793	
Strip—Hot rolled	7,307,280	223,592	37.3	142,907	27,880	878,643	36.4	575,314	93,067
—Cold rolled	3,236,940	98,937	37.2	88,662		381,010	35.6	356,671	
Wheels (car, rolled steel)	348,800	23,604	82.5	24,384		98,711	85.6	99,070	
Axles	416,170	18,101	53.0	17,173		72,070	52.4	71,329	
All other	150,270	3,601	29.2	5,517		12,956	26.1	20,878	
TOTAL STEEL PRODUCTS				5,744,177	533,160			23,359,177	2,058,314
Effective steel finishing capacity	64,722,000								
Per cent of shipments to effective finishing capacity				98.1				99.5	

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Committee Named To Handle Foundry Manpower Problems

Washington

• • • **Announcement has been made** by WPB that a National Foundry and Forge Shop Committee, representing five federal agencies, was set up at a meeting of the Forge, Foundry and Labor Advisory Committee to serve as a clearing house to deal with obstacles standing in the way of recruiting badly needed manpower for the industry and also to undertake all necessary measures to remove production obstacles. Jointly heading the committee are W. B. Murphy, WPB deputy vice chairman for production and Vernon A. McGee, WMC deputy executive director.

WPB said that the 300 foundries and forge shops that have been currently designated as "critical" are producing material at least 75 per cent of which is going into "must" equipment, but many other plants that are not listed as critical are nevertheless producing lesser quantities of vital forgings and castings.

The Foundry and Forge Labor Advisory Committee received a report from WPB representatives that a preliminary proposal to import Mexican nationals in the industry has been abandoned because the Mexican Government is not currently in a position to increase the quotas of workers for employment in the United States.

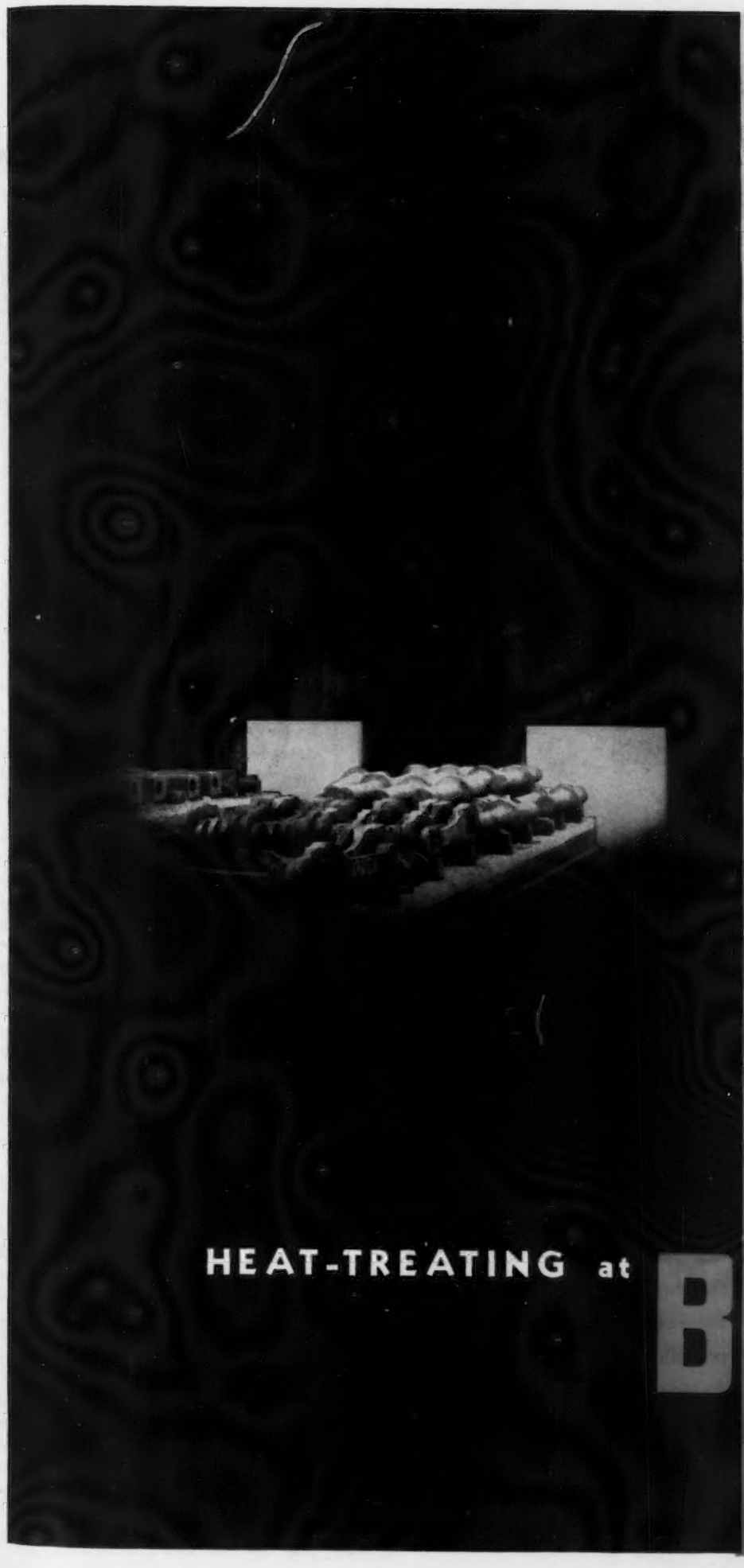
WPB and WLB spokesmen informed members of the Labor Advisory Committee, who complained that low wages are causing workers to leave foundries and forge shops, that WLB is giving special emphasis to speedy action on wage cases.

National Supply to Expand Oil Industry Goods Output

Pittsburgh

• • • **Developments now in progress** at the National Supply Co.'s Toledo, Ohio, plant will double present capacity for the manufacture of tool joints for the oil industry, and also will provide facilities for production of oil well rotary drilling equipment. Up to this time, National Supply's production of rotary drilling machinery has been confined to the company's Torrance, Cal., plant.

It is expected that full production of drilling machinery should be reached by January.



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Discuss Legal Phases Cost-Plus-Fixed-Fee Contract Termination

By JOHN W. KUHNEMUND
Attorney at Law, New York

New York

• • • It has long been settled by judicial determination that where the government suspends performance of a contract contrary to the agreed terms, the contractor is entitled to recover any damages he has sustained as a result of such suspension just as he would in the case of a breach of a private contract.

In the majority of the present day war contracts, in the absence of special statutory or contractual provisions, the contractor would, where the contract is cancelled at other than his fault, be entitled to recover the full anticipated profits as the measure of his damages.

The case of present day war contract terminations is not quite as clear as this however, because we do have special statutory provisions under which the contracts may be amended, and the great bulk of the contracts in existence do contain, or are being amended to contain, termination clauses.

In the termination of contracts following the first World War under the Act of 1917 which authorized such termination and which, of course, was deemed written into all contracts whether executed prior or subsequent thereto, it was consistently held by the Courts that the contractors' measure of damages was not his anticipated profits from the contracts, but instead was the value of the contract at the time of its termination; holding in effect that the termination was not a breach but instead was the exercise of the sovereign right of eminent domain.

Due to the prevalence in present contracts of termination clauses, and the authority for the amendment of existing contracts to include such clauses, it is not anticipated that the occasion will arise for this type of termination; but instead terminations are expected to be effected almost exclusively pursuant to the termination clauses therein.

Termination of contracts pursuant to the terms of a termination clause therein is, of course, not a breach of the contract, and any settlement thereon is limited to such as is provided in such clause or contract.

Up until very recently the termi-

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NO PART can be better than the casting from which it is made. Here at Permite we make aluminum and magnesium castings of real character—the kind of castings that give you better parts.

Permite castings mean reduced machining because of the high accuracy with which Permite Aluminum and Magnesium Castings are produced. The physical and dimensional qualities are assured by careful adherence to specification, close supervision and inspection, and advanced foundry technique. Quality is further controlled by X-ray inspection and spectographic analysis.

Permite castings save you money, because you can count on better parts, more quickly turned out and with fewer rejects. The quality remains in the part because it was put into the casting.

Inquiries from war production manufacturers given prompt attention. We are also prepared to consult with your engineers on postwar designs.

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nation clause used in each particular contract was left, as was the rest of the contract, to the regulation by each purchasing agency for itself, with the result that many varying provisions are now in existance.

In November, 1943, a much advocated step was taken in the establishment of a Joint Contract Termination Board, with a purpose of, among other objectives, consolidating the experience of the various purchasing agencies to the end of establishing a uniformity of contract termination provisions.

Early in 1944 the board adopted a Uniform Termination Article for Fixed Price Supply Contracts which, by directive order of the Director of War Mobilization must, unless specific authorization to the contrary is issued, be included in all, excepting the very small and those of a special (listed) nature, contracts executed by the major war supply purchasing agencies.

The directive further provided that all holders of existing contracts, of other than the excluded types, must be given an opportunity to amend their contracts to include the Article in substitution of any existing provision thereof for termination; or where no provision exists in the present contract, as an addition thereto.

This provision is being applied as anticipated, and it is expected that it will lead to the desired uniformity in so far as the contract provisions for termination are concerned.

The matter of the detailed procedure for the settlement of termination claims does not yet offer quite the same assurance of uniformity.

The War Department is, to date, the only purchasing agency to have issued complete directives on procedure. It is expected, however, in view of the fact that the War Department has had consideraby more experience with contract terminations and consequently further opportunity to establish a definite and just policy than has any other agency, that its procedural regulations and its **"Termination Accounting Manual"** will supply the basic foundation for directives to be promulgated by the other agencies, or possibly a joint directive or Congressional action. For these reasons the War Department procedure will be used as a basis for our discussion of procedure below.

The Uniform Termination Article makes provision in the first instance for negotiation between the contracting officer (assisted by an advisory

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We of Shafer believe our product is superior for the machines for which it is offered. The principle upon which Shafer Concavex Self-Aligning Roller Bearings are designed appears to meet the theoretical considerations that apply, as well as practical tests, to a greater extent than bearings not using this principle.

Nevertheless, we are constantly seeking out refinements in design, methods of manufacture, application or use that will result in even smoother performance, longer life, or improvements in design in the machines and equipment these bearings serve.

In view of the tremendous technological progress made during the war and the additional thousands of outside engineers and technicians who have become familiar with Shafer Bearings, we believe new uses may have been found for Shafer Bearings, or ideas for their improvement which we hope will thus be brought to our attention.

It is evident that bearing quality and performance will count heavily in the days ahead, because of the reductions in machine costs, the greater machine productive capacity, the gains in the welfare of the nation that can accrue from better machine performance. And certainly any men responsible for improvements in bearing use and manufacture may well merit the nation's recognition.

All suggestions and ideas will be judged by the following authorities:

JOHN J. SCHOMMER, Professor of Industrial Chemistry, Illinois Institute of Technology. Nationally recognized authority on industrial processes and engineering design.

PHILLIP C. HUNTLEY, Formerly Head of Mechanical Engineering Department, now Head of Civil Engineering Department, Illinois Institute of Technology. Widely known engineering consultant.

CHARLES A. NASH, Associate Professor Electrical Engineering, Illinois Institute of Technology. An Authority of broad practical experience in Electrical and Mechanical Engineering.

ARTHUR H. WILLIAMS, Vice-President, in charge of Engineering, Shafer Bearing Corporation.

Awards as stated above will be made on the basis of the merit in whatever ideas are submitted as valuable contributions to the art of design, manufacture, application or use of Shafer Self-Aligning Bearings. The opinion of the judges will alone determine the relative merits of any ideas submitted and all decisions of the judges will be final. In the event of any ties, identical or duplicate awards will be made. The Shafer Bearing Corporation reserves the right to adopt or make use of any ideas submitted.

There are no restrictions as to entrants, number of entries, or the form in which the latter are made. All entries received on or before September 1, 1944 will be eligible and awards made as soon as possible thereafter. Winners will be notified by mail and announcements in magazines of national circulation.

Address all entries to the Shafer Achievement Awards Committee

Shafer Bearing Corporation

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group in the department), and the contractor, as a means of settling any controversy as to the amount due by reason of the termination; and empowers the contracting officer, in the event that negotiations to this end are not successful within a 90 day period from the effective date of the termination notice, or such other time as is agreed upon between the contractor and the contracting officer, to make a settlement by formula method set forth in the Article.

The Joint Contract Termination Board in a statement of principles approved Dec. 31, 1943, states that in the determination of costs upon terminations under the Uniform Article it is the intent of the government to compensate for all direct and indirect manufacturing, selling, distributing, administrative, and other costs which are reasonably necessary for the performance of the contract, and properly allocable thereunder in recognized commercial accounting practices. The statement then goes on to recite in a general manner the types of the above costs included within the intent and those excluded. It is to be noted that provision is made for reimbursement of the expenses incurred in conversion to war production but not for the reconversion to peace time production.

The settlement procedure under War Department regulations is initiated in the first instance by the contractor preparing and filing with the contracting officer a statement showing the amount due by reason of the termination. This statement is prima facie, under the Regulations, the contractor's proposal for a negotiated settlement pursuant to the terms of the Termination Article in the contract.

Inasmuch as the prime contractor has the responsibility of settling with sub-contractors, subject to the approval of the contracting officer, there is to be submitted with the prime contractor's statement, the statements of the respective subcontractors to him, together with his recommendations or certification thereof. At least an office audit of each statement by the department is prescribed.

No attempt should be made by a contractor or his accountant to prepare the termination statement without first studying carefully the Procurement Regulations and the **"Termination Accounting Manual."** The manual is particularly helpful in the procedural detail attendant upon the preparation of the statement.

It cannot be emphasized too strong-

ly that before the statements are filed they be checked thoroughly, making certain that each item therein is covered in sufficient detail to apprise fully and fairly the contracting officer as to its being incurred in contemplation of the completed contract; for the Uniform Article makes the contracting officer the final and ultimate arbiter of the factual questions involved in the settlement, and in such a case the rule is clear and upon good logic that in the absence of fraud or strong evidence of bad faith, the original determination of factual questions cannot be upset or even reviewed by the courts.

The importance of this provision is emphasized when it is realized that most of the problems that will arise in contract terminations will be of a factual rather than of a legal nature. An example of this is where a particular building was renovated and reconditioned for the purpose of performing the contract; but was carried on the company's books and listed in its statement merely as "building repair." Of course, the contracting officer felt, and justly so from the record, that the cost thereof should have been allocated between the contract and nonwar business. The contractor felt, quite as justly, that the cost was solely a part of the expense incurred in contemplation of the completed contract.

The sad part of these matters is that, as is usual in factual disputes,

---

NEW REFRIGERATOR: *A small tractor and a large fuel servicing truck emerge from the new test refrigerator built by the York Corp. at Wright Field, Ohio. The 80-ft. long cold chamber is capable of operating at temperatures lower than —70 deg. F.*

the dispute would not have arisen, or in the above example the expense challenged, if the records had been kept, and the statement prepared, with sufficient clarity and detail.

The possible factual questions that can and do arise where insufficient care is used in the contractor's records and in his settlement statement are, as can be imagined, almost fantastic.

As a final caution, attention is called to the fact that the contracting officers have full power to make binding and final settlements; and while the Procurement Regulations provide that "failure specifically to enumerate any element of cost is not intended to exclude any element of cost fairly to be included in accordance with the general principles outlined," an ounce of prevention is worth a pound of cure, and hindsight is not easily applied.

Partial payments are at the present time the subject of Congressional study and several bills are now pending with varying provisions to assist manufacturers needing the funds before the time which must necessarily elapse before final settlement can be accomplished.

Under present regulations, contracting officers are authorized to make partial payments before final settlement both to prime contractors and for the benefit of subcontractors, where it appears that least such amounts are clearly due. It is recommended that an effort be made to secure such an advance purely "on account" where immediate funds are required, rather than rush final settlement.

Switch to Triple Alloy Steels Cut Screw Output

• • • **Some production** losses in experimental runs of socket screws made with triple alloy steel instead of single alloy were reported by members of the Socket Screw Industry Advisory Committee at their recent meeting, the WPB announced. Anticipated production problems arising from the use of triple alloy steel were reviewed at the meeting.

The committee recommended that single alloy steel be provided in sufficient quantities to maintain current production until satisfactory tests with triple alloy are completed.

Production losses would be particularly serious at present, WPB reported, since the radio and electronic equipment programs are heavy users of special size socket screws.

...but the Values are SPECIAL

Outwardly, the long skids of car side frames and bolsters in the PSF plant are merely faithful reproductions of the customer's "specs." But inwardly, it's another matter . . . they're the products of long experience and the latest facilities, with all the resulting advantages in the way of improved structure, clean surface, dimensional accuracy and top service qualities. In *your* product planning, figure on "steel castings by PSF."

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Cleaning Important In Overseas Shipments

Cleveland

• • • **Much has been** learned about the use of specific packaging materials, but the overall lessons learned confine themselves to the knowledge that cleaning of finished parts before protective coating or packaging is of utmost importance; that good ventilation on certain types of packages must be obtained; that present specifications are basically right; and that the types of packages now used are satisfactory.

The need to use dry dunnage in bracing and packing was also stressed. These conclusions were emphasized by Neil A. Fowler, chief of the packaging section, Army Ordnance, after a 31,000 mile trip to inspect packaging results in the South Pacific.

The I-A package, which presents a water barrier but not a vapor barrier, was termed highly satisfactory. The Method II pack, which affords complete vapor protection plus a desicant, was also fully satisfactory. Poor cleaning before protective packaging, however, was responsible for some failures of all types of packaging.

Boxing specifications appear to be right, as boxes built to specifications did not fail, although some under specification boxes were found seriously damaged. The results were termed generally good. Plywood was reported satisfactory when toxic treated after cutting to size. Butt joined lumber was recommended.

Ventilation was pointed to as vitally important in machine tool packaging. Rotting is said to be very bad in the island climates due to heavy condensation, and ventilation helps to offset this. Holes were recommended for ventilation purposes with screening to prevent entrance of insects. Termites were reported bad only in Australia but not so serious in the islands.

In shipping electrical equipment the use of moisture vapor barrier type packs was especially recommended.

Also on the subject of electrical assemblies the need for wearing gloves and applying temporary rust preventives during assembly was stressed. A warning was issued regarding the use of water displacing preservative coatings. These, it was cautioned, have a tendency to leave water in blind holes. The alternate offered is to rotate the part and pay special attention to false bottoms or conical bottoms.

SAVING 215 GALS OF CUTTING OIL DAILY

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WRINGING 4 TONS OF CHIPS IN 4-5 HOURS DAILY, this busy Chicago plant processes the turnings from 11 automatic screw machines and 1 thread miller in one Tolhurst "Chip Wringer." Result—125 gallons of fresh cutting oil from 2 tons of brass chips; 90 gallons from 2 tons of steel chips. Tolhurst "Chip Wringers" recover as much as 98.6% of the cutting oil—*by centrifugal force only.*

INCREASING SCRAP VALUE OF CHIPS, by wringing them is another saving to Tolhurst users. Dry chips from the wringer are normally ready for remelt and re-use.

A FRESH SUPPLY OF CUTTING OIL, always available, encourages a conscientious use—and *reduces tool wear.* As much as 50% increase in tool life has been shown by toolroom records after installing Tolhurst equipment.

OPERATED BY UNSKILLED HELP, Tolhurst "Chip Wringers" present a real economy. The routine is simple and rapid, enabling a plant to keep its floors clean and thus *reduce fire and accident hazards.*

Descriptive bulletins, installation data and prices are available on request.

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Continuous Heat Treatment of Aluminum

(*Continued from page* 60)

tion. A "zero-speed" switch de-energized the reverse coil when the conveyor came to rest.

The length of conveyor movement is still somewhat dependent upon friction, load, and speed. A control linked with the conveyor drive would be more positive. The ideal circuit would be one that would rotate the conveyor drive a predetermined number of revolutions.

Start of quench: If quenching is delayed more than 10 sec., 24S aluminum alloy may become susceptible to intergranular corrosion. The original automatic control circuit turned on the quenching water as soon as the doors closed. When loads exceed 1 ft. in length, more than 10 sec. elapse before the doors close. It was necessary, therefore, to arrange to turn the quenching water on before this time. To accomplish this, a new timer was added to the automatic control that could be preset to turn on the quenching water at any desired time. To minimize the splashing from the quenching chamber back through the open door into the heating chamber, air jets were placed in front of the exit door.

Spray quench: In order to quench rapidly, the spray used in the quenching chamber must be intense and evenly distributed. The nozzles furnished with the original equipment employed a whirling disk to atomize the jet and the nozzles were found to clog with bits of trash that accumulate in the recirculated quenching water. After considerable investigation, a nozzle was selected that atomized the jet by channeling the incoming water into a helical pattern before discharging it through a circular orifice. While not ideal, the present nozzles produce a dense fog spray and rarely clog.

In view of the size and complexity of this conveyor furnace, these changes are of little consequence. On the whole, the furnace, has done its work well. It has proved especially useful in heat-treating long bomber parts. The experience gained by pioneering this equipment should prove of value in future efforts to simplify and refine aluminum heat treating, a process which is currently being performed in most factories by manually operated equipment.

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★ In the field of air power . . . air power as utilized in hundreds of ways by industry . . . the PESCO precision air and vacuum pumps designed for modern aviation incorporate features that offer all industry distinctly better and more efficient pumping facilities.

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The improved, positive displacement vane and rotor type pumping mechanisms now embodied in PESCO air pumps are readily adaptable to many applications where volumes of gases must be moved under low or medium pressure. This same PESCO advanced design and precision manufacture extends through a complete line of air, vacuum, hydraulic and fuel pumping equipment . . . superior equipment that meets practically all needs for controlled liquid flow and pressurized power.

We would welcome the opportunity to tell you of our facilities to engineer PESCO equipment to meet your own specific problem. Just write for complete details.

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PERFORMANCE POINTS TO Pesco FIRST

Among the Week's Trade Notes

Cleveland Automatic Machine Co., Cleveland, has opened a district office in the Capitol National Bank Building, Hartford, Conn. W. O. Aldrich will manage the new office.

•

American Chain & Cable Co., Inc., Bridgeport, Conn., has acquired the Wilson Mechanical Instrument Co., Inc., New York, sole maker of the Rockwell hardness tester.

•

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., announces that construction has begun to increase the neoprene plant capacity at Louisville by 50 per cent.

•

Newman Bros., Cincinnati, has purchased an additional plant in Cincinnati at Fifth and Cutler Streets, for postwar expansion.

•

Timken Roller Bearing Co., Canton, Ohio, has organized a subsidiary, the Timken Roller Bearing Co. of South America. After the war, under the direction of Jules A. Moreland, the new firm will handle engineering development of Timken products in the Latin-American countries.

•

Tile Craft, Inc., Chicago, has been granted exclusive representation of the Chas. Taylor Sons Co. refractories.

•

Roche, Williams & Cunnyngham, Inc., announces a change of name to Roche, Williams & Cleary, Inc., and the removal of its Chicago offices to the Field Building, 135 South LaSalle Street.

•

Oil Well Supply Co., U. S. Steel subsidiary, has contracted to acquire the Witte Engine Works, Kansas City.

•

Progressive Welder Co., Detroit, has transferred partial ownership of the company to its employees as the result of stock purchases by individual workers.

•

McCarthy Steel Warehouse Co. has opened up an iron and steel warehouse at 1721 Normal Avenue, Chicago.

•

R. H. Watson Automatic Machine Co., Cleveland, has been organized and incorporated. J. A. Feingold represents the firm.

•

George Keller Machinery Co., Buffalo, has been appointed exclusive distributor for western New York state of RTD thread rolling dies and reed cylindrical die thread rollers, produced by Rolled Thread Die Co., Worcester. C. H. Briggs Machine Tool Co., Inc., Syracuse, N. Y., has been appointed distributor for central New York and northern Pennsylvania.

•

Barber-Colman Co., Rockford, Ill., announces the appointment of the Wain Engineering Co., Omaha, Neb., as its distributor for control and air distribution products in the Omaha territory.

•

Hardinge Brothers, Inc., Elmira, N. Y., has established an engineering and service office at 4460 Cass Avenue, Detroit 1. Charles Boland will be in charge.

•

Herr-Harris Co., Pittsburgh, has been appointed representative of the Edward Valve & Mfg. Co., Inc., in the Charleston, N. C., and central West Virginia territory.

•

Cannon Electric Development Co. has announced the appointment of five new engineering representatives for the company. They are: J. L. Wright, Jr., 6109 North Meridian Street, Indianapolis; Franklin Sales Co., Central Savings Bank, Denver; Bruner Corp., 418 West North Avenue, Milwaukee; Southern Sellers, 918 Union Street, New Orleans, and Mountain States Engineering Co., 215 West Second, Salt Lake City.

•

Perfex Gage & Tool Co., Detroit, announces the appointment of Gilbert Morgan as its

Could be!

NOTHING is impossible to American inventive, engineering, and manufacturing genius—to the dreaming, and daring and doing of free men, under the inspiration and challenge of the free American system.

Particularly is the world dumfounded by our sudden strides in aviation—by the imagination, sheer genius and daring of our aeronautical engineers—by the quality and speed of American aircraft production—by the matchless performance of our aircraft—by the over-all miracle of this country's gigantic aircraft industry.

Yet the ultimate, in American aircraft development, hasn't even been intimated. If our engineers could reveal the merest fraction of what they are realistically planning, for the peaceful years to come, would they be laughed at as Wilbur and Orville Wright were, in 1903?

No—not after what the world has seen this nation do, in the air, during the past two years!

• • •

HOUDAILLE* is proud to have been of service to the American Aircraft Industry. Our engineering and precision skills are contributing vitally to the American aeronautical progress. We hope to contribute even more to it in the peacetime days ahead.

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Manufacturers of precision parts and equipment for the automotive, aircraft, railway, maritime, mechanical refrigeration, radio and other industries

*Pronounced: **"HOO-DYE"***

representative in the Chicago territory. His office is located at 30 North LaSalle Street.

•

Eccles & Davies Machinery Co., Inc., Los Angeles, has been appointed southern California representative of Lester-Phoenix, Inc., Cleveland.

•

Seattle-Tacoma Shipbuilding Corp., Seattle, has changed its name to Todd Pacific Shipyards, Inc.

•

Frederic Flader Co., aircraft designers and consulting engineers, has been formed by Frederic Flader of Buffalo.

•

Star Brass & Bronze Co., Philadelphia, has moved to new and larger quarters at 1035 Sarah Street.

•

M & H Tool & Engineering Co., has been organized at Milwaukee by Louis Hansen, Orville Morisette and Walter T. Nortman, 1135 W. Vliet Street.

•

Scanlan-Morris Co. and the Scanlan Laboratories, Inc., both at Madison, Wis., have been merged with the Air Reduction Co.

•

Muroc Army Air Base, Muroc, Cal., authorization for construction of additional hangars, parking aprons, and minimum essential utilities. The authorized expenditure is in the amount of $720,000. Work will be supervised by the Los Angeles District Office of the Corps of Engineers.

•

Muroc Army Air Base, Muroc, Cal., authorization for paving extensions of existing runways, construct new taxiway and additional parking apron. The authorized expenditure is in the amount of $500,000. Work will be supervised by the Los Angeles District Office of the Corps of Engineers.

National Steel Corp. Makes Annuity Plan More Inclusive

Pittsburgh

• • • **Amendment of the** Retirement Annuity Plan in effect in National Steel Corp. and all subsidiary companies will make it possible for several thousand additional employees to participate in its benefits, it was announced by Ernest T. Weir, chairman.

The original plan was intended to provide supplemental annuity for those employees whose annual earnings were over the $3000 per year maximum provided under the Social Security Plan. The new plan is open to all employees, regardless of the amount of annual earnings, who are not less than 30 nor more than 65 years of age, and who have been employed by the company for not less than five years.

Under the retirement plan monthly contributions are made by both the employees and National Steel Corp. and its subsidiary companies Through this arrangement all employees will receive on retirement at least double the annuity that the employee's contributions alone would purchase from any standard insurance company.

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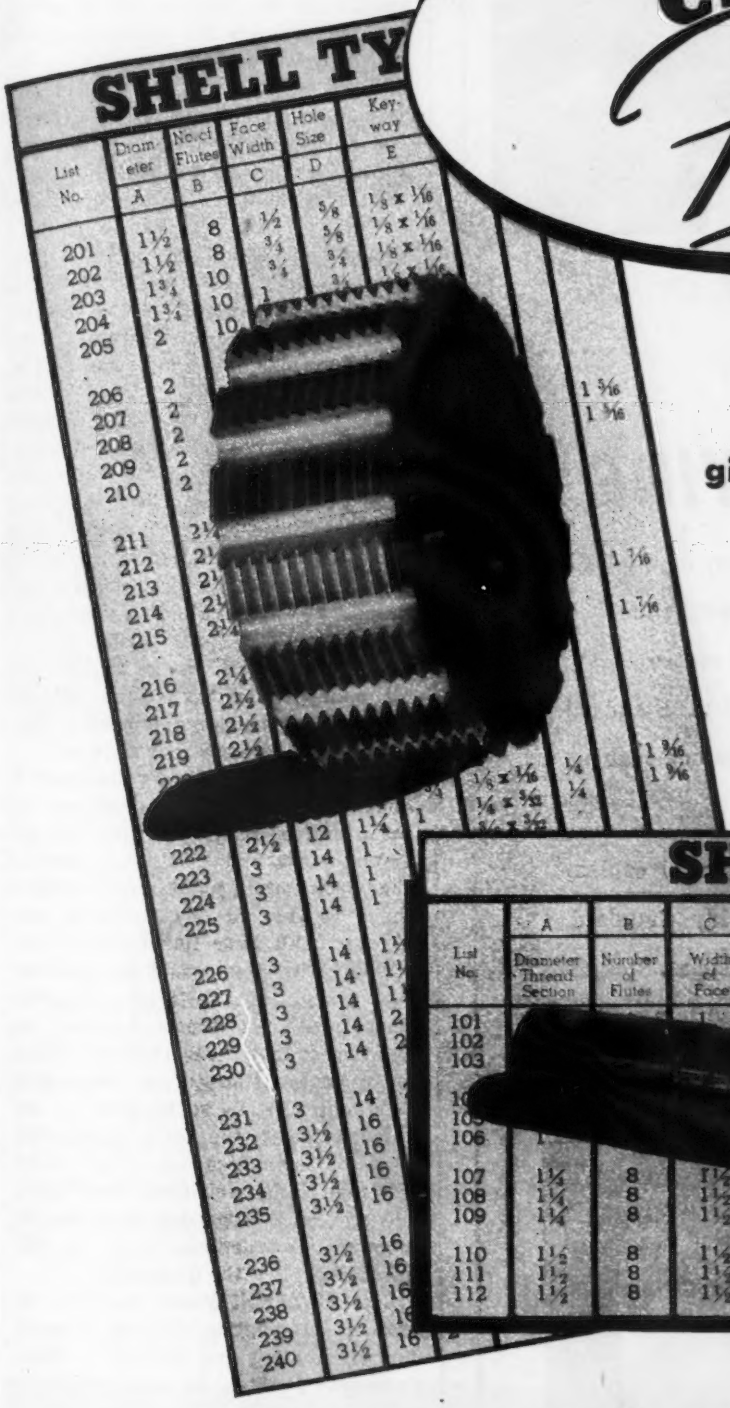

SHELL TY

List No.	Diameter A	No. of Flutes B	Face Width C	Hole Size D	Keyway E
201	1½	8	½	⅝	⅛ x 1/16
202	1½	8	¾	⅝	⅛ x 1/16
203	1¾	10	¾	¾	⅛ x 1/16
204	1¾	10	1	¾	¼ x 1/16
205	2	10			
206	2				1 5/16
207	2				1 5/16
208	2				
209	2				
210	2				
211	2¼				
212	2¼				1 7/16
213	2¼				
214	2¼				1 7/16
215	2¼				
216	2¼				
217	2½				
218	2½				
219	2½				1 9/16
220					1 9/16
222	2½	12	1¼		
223	3	14	1		
224	3	14	1		
225	3	14	1		
226	3	14	1¼		
227	3	14	1¼		
228	3	14	2		
229	3	14	2		
230	3	14			
231	3	14			
232	3½	16			
233	3½	16			
234	3½	16			
235	3½				
236	3½	16			
237	3½	16			
238	3½	16			
239	3½	16			
240	3½	16			

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STANDARD STOCK BLANKS MEET 90% OF ALL THREAD MILLING CUTTER REQUIREMENTS

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101				3 11/16	5¼	.884	7			½-13NC
102					5¼	.922		8		⅝-24NF
103									3	½-13NC
104										½-13NC
105										⅝-24NF
106										½-13NC
107	1¼	8	1½							½-13NC
108	1¼	8	1½	4⅛	6¼					⅝-24NF
109	1¼	8	1½	3⅛	5½	.948				½-13NC
110	1½	8	1½	4 11/16	6¾	1.134	9			½-13NC
111	1½	8	1½	4⅛	6¼	1.271		10		⅝-24NF
112	1½	8	1½	3⅛	5½	.948			3	½-13NC

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Rockwell Outlines Highlights of New Withholding Plan

New York

• • • A plan for withholding a percentage of present war production profits for the postwar benefit of returning veterans and unemployed war workers, was outlined recently by Col. Willard F. Rockwell, Pittsburgh and Detroit industrialist, during a luncheon at the Waldorf-Astoria, attended by business leaders, labor representatives and members of the press.

Rockwell disclosed that he has petitioned President Roosevelt and Congress for permission to institute this postwar plan in his own companies.

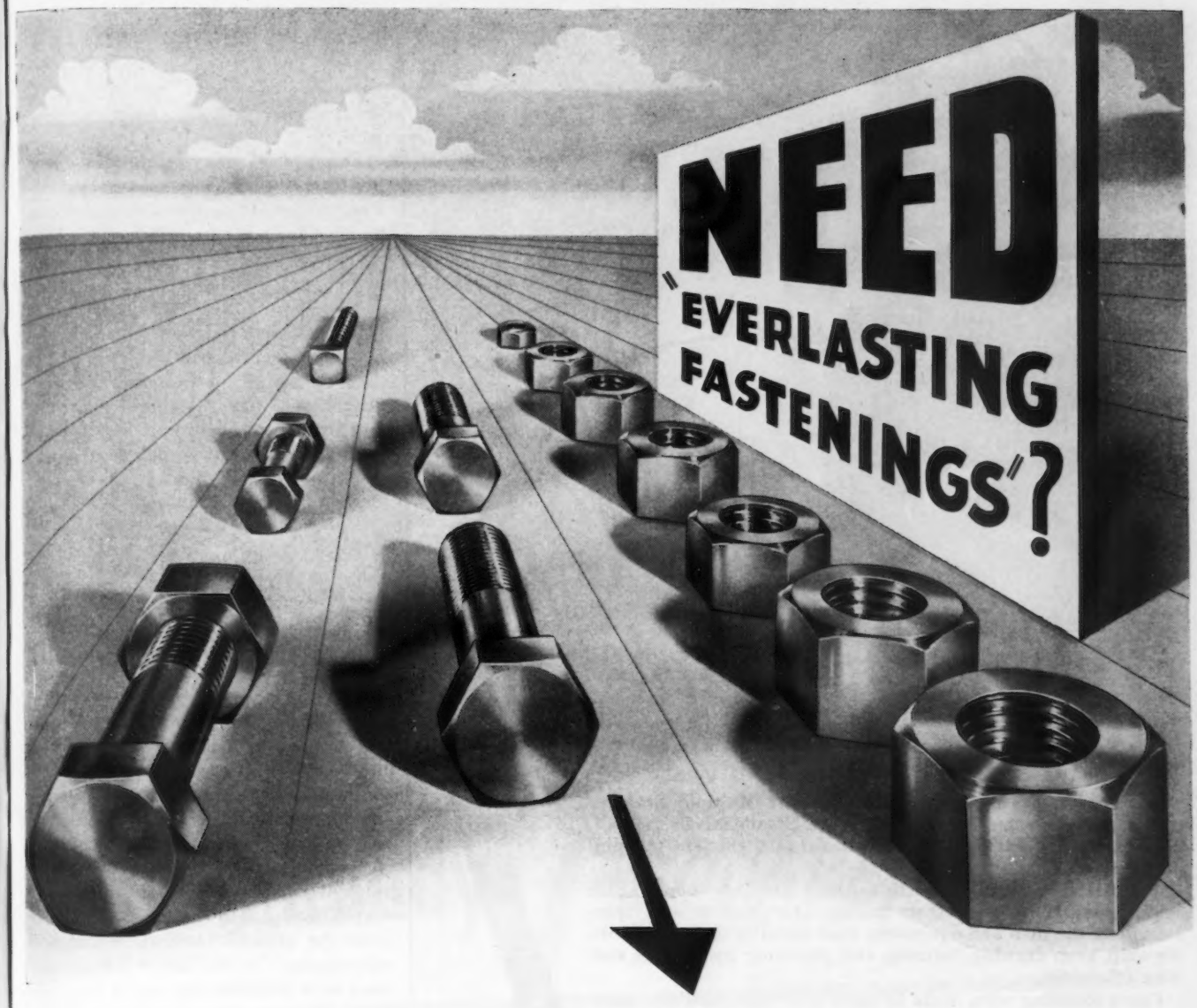
In essence, the "Rockwell Plan" provides that war producers shall be permitted to withhold from profits, after taxes and dividend or interest requirements, but before renegotiation, sums ranging up to one week's average wages or salary for each month an employee has worked in a war plant, with a maximum withholding of 24 weeks' wages for each employee who has worked a minimum of two years.

A similar provision is included for all members of the armed services who left gainful employment in factories now engaged in war work.

These funds are to be disbursed if and when contract terminations and reconversions result in substantial unemployment, and until such time as the participating plants can re-employ their workers or the dismissed employees shall have found other work.

The entire plan would be under the supervision of the Social Security Board, with all unpaid balances remaining in these reserves two years after final settlement of terminated war contracts, to be returned to the government in the form of windfall taxes. Companies operating under this plan, it is envisioned, would have the use of unexpended reserves for reconversion purposes until the balances were due the Treasury.

The "Rockwell Plan" contains six basic points dealing with the formula for withholding and disbursing funds from war profits. In addition it contains a suggestion that the government establish a board of businessmen to survey the complicated surplus property and production facility inventories now in the hands or under control of government procurement agencies, for the purpose of recommending immediate steps to reduce



The Harper organization devotes its energies and facilities exclusively to non-ferrous and stainless fastenings. It manufactures bolts, nuts, screws, washers, rivets and specials of Brass, Bronze, Copper, Everdur, Monel and Stainless. It produces nothing in common steel or iron.

Harper offers a large and widely assorted stock of over 4280 different items . . . extensive manufacturing facilities . . . a major department engaged in designing and producing "specials" . . . engineering "know-how" . . . and field service difficult to match elsewhere. All of which means much to the fastening buyer and user.

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these surpluses so as not to dislocate the national economy when the war ends.

Citing the many plans and proposals now under consideration by Congressional committees, Rockwell pleaded for a return to practical common sense in planning for the future of industry and labor.

"Industry and labor both face a bewildering variety of plans, from blue sky blueprints that call for a '$50 every Friday' form of government-guaranteed weekly wage to fantasies bordering on the brand of economic scarcity by executive decree that almost ruined this country in the mid-thirties," Rockwell stated.

"Bernard Baruch clearly states, in his report on postwar operations, that the government cannot guarantee prosperity. However, there are many who would like to see our government make the attempt to do so.

"Labor and industry have a vital interest in the maintenance of production and consumption in this country. Labor and industry have a vital interest in seeing that common sense and practicality are the measures that guide our thinking in the projection of any postwar plans.

"I firmly believe in the principle of renegotiation," Rockwell remarked emphatically. "However, I do disagree with the present application and administration of this law. When it is used as a punitive weapon it then defeats its own purpose. War profits, channeled into useful reserves to protect our national economy, will accomplish the maximum useful purpose."

MRO Procedure Rules Clarified

Washington

• • • **Rules governing** the use of the maintenance, repair and operating supplies (MRO) procedure for obtaining minor capital additions have been clarified by the issuance of an amended interpretation. The MRO procedure may be used to obtain materials and equipment for minor capital additions where the cost of such addition does not exceed $500, excluding the purchaser's cost of labor. This is provided for in CMP Reg. 5.

Interpretation No. 11, as amended to CMP Regulation 5, points out that all labor costs involved in the manufacture of the material or equipment must be included in figuring the cost of an addition. The cost of labor used in construction or installation of a minor capital addition need not be included in figuring the cost.

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Dealer Association Confers on Machine Tools Markets; Prices

New York

• • • **Export markets** for used machine tools and OPA price regulations were among the topics discussed at the second wartime conference of the Machinery Dealers' National Association, held in New York recently. Ray A. Vine, president of the association, was able to report a growth in membership of this relatively new group, now numbering over 130 members, and the appointment of an active committee to study postwar problems. He pointed out that in 1943 the entire industry had sold 112,000 second-hand machine tools valued at $140 million.

Despite the fact that the production of machine tools has been enormous in all industrial countries in the past few years, a lot of foreign countries are hungry for good, used machine tools, especially Mexico and Brazil, according to W. H. Myer, chief, machinery and motive products unit, Department of Commerce, who spoke on postwar foreign trade. Export trade provides a logical postwar market, he said, despite excellent competition, particularly from Great Britain which is planning to re-establish its markets. As regards South America and the Continent, Germany was our chief competitor in machine tools before the war and Mr. Myer expressed the hope that future conditions will not foster unfair trade tactics on the part of Germany.

To obtain such business in the face of foreign competition, the speaker suggested sound policies to be pursued and criticized past practices, such as selling on the basis of cash on order, sight unseen. He also thought it a shortsighted policy to do a "paint brush" rebuilding job and proposed the setting up of an impartial inspection system that would not cost the buyer too much. He warned about packaging securely against the hazards of a long ocean voyage and urged that his listeners obtain a copy of Trade Promotion Series No. 7, "Modern Export Packaging," from the Government Printing Office, Washington (Price $1).

Mr. Myer cautioned the dealers to pay strict attention to customer instructions, which were generally given for some good reason. Courteous, careful treatment should be given to inquiries which under today's conditions were often ignored. He

also warned the exporter against sporadic efforts and half-way measures. The business, once established, should be treated seriously year in and year out.

Analyzing each foreign postwar market individually, Mr. Myer indicated that under favorable conditions Russia will buy more American machine tools than all the other countries combined. Although Russians admire U. S. mass production methods and are inclined to specify the very latest types of machine tools, Myer saw a reasonable opportunity to sell large quantities of used machine tools. No sudden, large market was seen in China because of the lack of industrial know-how.

Violations of MPR No. 1 relating to ceiling prices on used machinery have been very few, according to Edwin C. Henn, acting chief, OPA machine tool section, who praised the cooperation given by the used machinery industry. Although requests had been made that Form 100:1 be discontinued in reporting sales of machines built prior to 1930, Mr. Henn indicated that the form would be retained for the present inasmuch as 90 per cent of used machine tools sold fell into that classification. He was followed by J. A. Carlin, consultant of the OPA machine tool section, who answered questions relating to the administration of MPR No. 1 and its five amendments.

Arbitration is the most efficient way to obtain justice in settling commercial disputes, declared Paul Fitzpatrick, vice-president, American Arbitration Association, an organization which has 9350 voluntary arbitrators available. Using an impartial panel and common sense gets around the mumbo-jumbo of legal phraseology and re-establishes friendly relations between disputants, often a buyer and seller. Foreign purchasing commissions are all using arbitration clauses in their buying contracts, making it feasible to do business with unsueable sovereign governments, the speaker pointed out.

In recognition of the excellent work he has done for the organization in the past year, Ray A. Vine, R. A. Vine Machinery Co., Detroit, was reelected president of the MDNA and Louis Botwinik, Botwinik Brothers, New Haven, Conn., was reelected first vice-president. The new second vice-president is Samuel Morey, Morey Machinery Co., Inc., New York. Frank D. Daley, Daley & Sibley, New Haven, was named treasurer. Josephine Cor-

coran continues as executive secretary.

Elected as directors for a two-year term were Joseph T. Weiss, Interstate Machinery Co., Inc., Chicago, and Joseph Beal, Joseph Beal & Co., Boston. Directors elected for one year include: Charles L. McDonald, Sr., McDonald Machinery Co., St. Louis; Harold H. Blumberg, Adams Machinery Co., Chicago; Samuel Given, Given Machinery Co., Los Angeles; George R. Shuman, Prussian Machinery Co., Inc., Detroit; Joseph E. Duff, Duff & Spiro Machine Tool Co., New York, and Samuel Danits, Donberg & Danits, Chicago. Four newly elected chapter chairmen will also serve on the board of directors: Myron M. Segal, Segal Machinery Co., Chicago; Max Leach (New England Chapter), H. Leach Machinery Co., Providence; J. Lee Hackett, J. Lee Hackett Co., Detroit, and Ralph Hochman (New York Chapter), Ralph Hochman & Co., Newark, N. J. George M. Bernstein of Chicago and Harvey H. Goldman of Detroit carry over as directors from last year.

Serving on a newly formed postwar planning committee are Messrs. Danits, Given, Goldman, Leach, Shuman, Louis Botwinik, Allen B. Gellman, Interstate Machinery Co., Chicago, and Sidney Kriser, Industrial Plants Corp., New York.

Defense Plant Corp. Lists Authorized Contracts

Washington

• • • **Defense Plant Corp.**, RFC subsidiary, has authorized the following contracts:

Timken Roller Bearing Co., Canton, Ohio, to provide additional equipment and machinery at a plant in Newton Falls, Ohio, at a cost in excess of $280,000, making a total commitment of more than $1,975,000.

Parker Appliance Co., Cleveland, to provide additional equipment at a plant in Cleveland at a cost in excess of $100,000, making a total commitment of more than $1,325,000.

International Business Machines Corp., New York, to provide additional equipment at a plant in Poughkeepsie, N. Y., at a cost in excess of $160,000, making a total commitment of more than $560,000.

Savage Transportation Co., Inc., San Francisco, to provide automotive equipment for operation in the San Francisco area at a cost in excess of $220,000.

McAleer Mfg. Co., Rochester, Mich., to provide additional plant facilities at Rochester at a cost in excess of $65,000, making a total commitment of more than $170,000.

American Hoist & Derrick Co., St. Paul, to provide equipment at a plant in St. Paul at a cost in excess of $85,000.

•

The War Department has authorized the following contract:

Langley Field, Hampton, Va., authorization for reconstruction of runways, taxiways, and parking aprons. Authorized expenditure is $2,000,000. Work will be supervised by the Norfolk, Va., District Office of the Corps of Engineers.

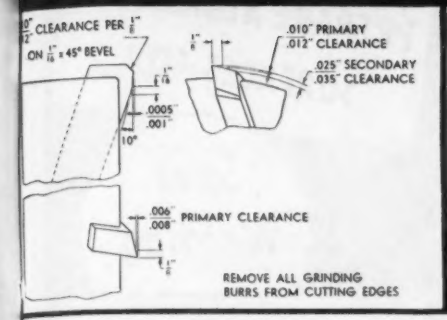
Wright Field, Dayton, Ohio, authorization for construction of taxiways, access and service roads, firing range and skeet range, sidewalks, extension to equipment test building, etc. The authorized expenditure is $590,000. Work will be supervised by the Wright Field, Dayton, Ohio, District Office of the Corps of Engineers.

Award of contract to Macco Construction Co. and Morrison-Knudsen Company, Inc., Ferry and Freight Streets, Oakland, Cal., for construction of fill for extension of runway at San Francisco Municipal Airport, Cal. The estimated amount of the contract is $2,013,000. Work will be supervised by the San Francisco District Office of the Corps of Engineers.

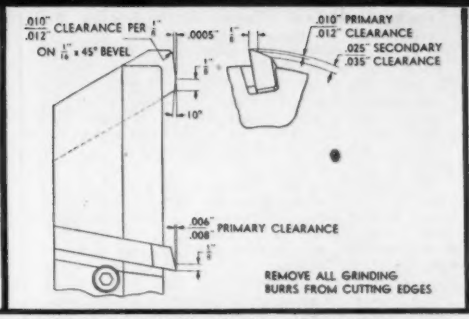
Fort Crook Aircraft Assembly Plant, Fort Crook, Neb., authorization for construction of improvements to airfield to consist of strengthening of existing runways, construction of shoulders, paving, marking of runway areas, seeding, drainage adjustments, etc. The authorized expenditure is $1,288,640.

INGERSOLL *Grinding Chart*

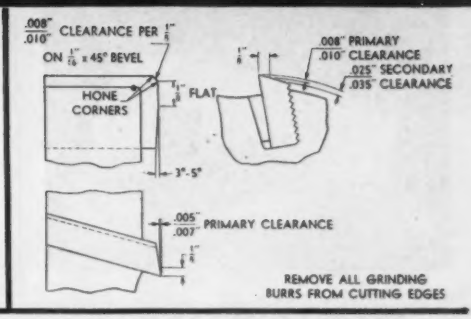
BASIC GRINDS FOR STANDARD CUTTERS



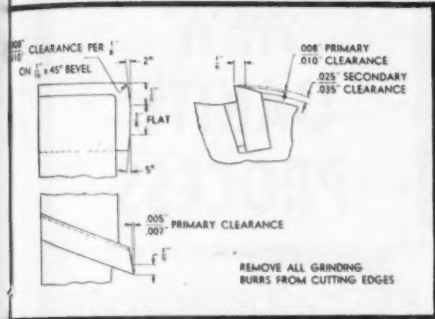
GRIND 1. Rough Milling Cast Iron.



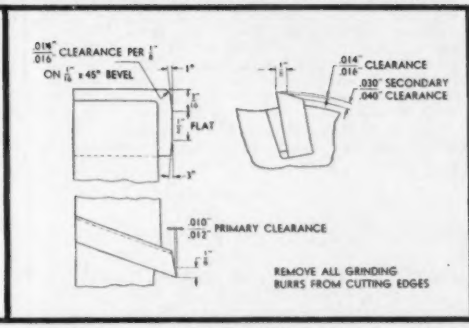
GRIND 2. Finish Milling Cast Iron. The .0005" high heel may have to be changed to suit the tilt of the spindle. This can be determined from the finished surface.



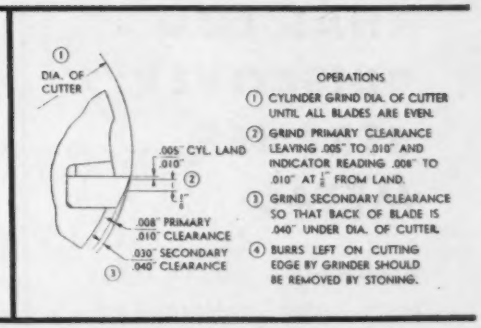
GRIND 3. Rough Milling Low Carbon Steel.



GRIND 4. Finish Milling Low Carbon Steel. If chatter is encountered, reduce the length of flat on face.

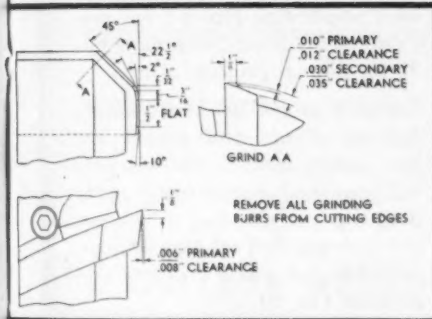


GRIND 5. Rough and Finish Milling Aluminum. Hone to a keen smooth cutting edge.

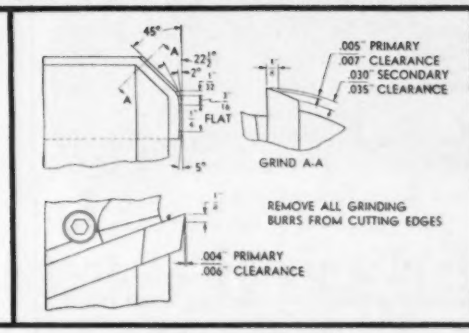


GRIND 6. Helical Slab Milling Cutter.

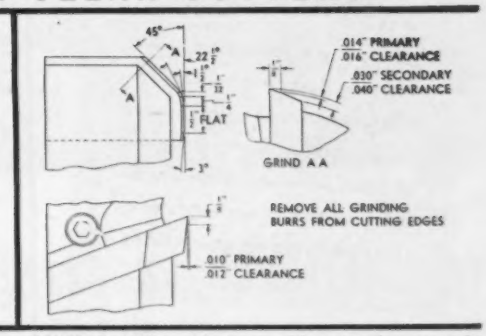
BASIC GRINDS FOR INGERSOLL SHEAR CLEAR CUTTERS



GRIND 7. Milling Cast Iron.

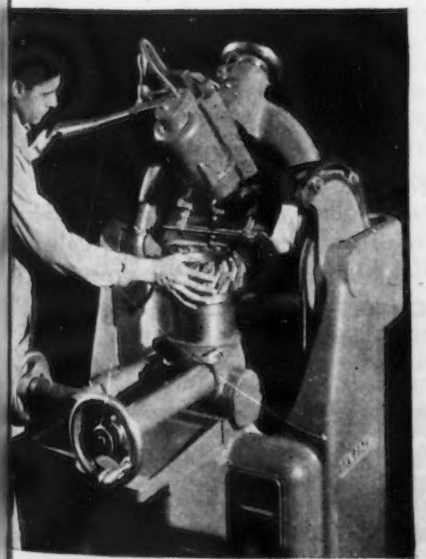


GRIND 8. Milling Steel.



GRIND 9. Milling Aluminum. Hone to a keen smooth cutting edge.

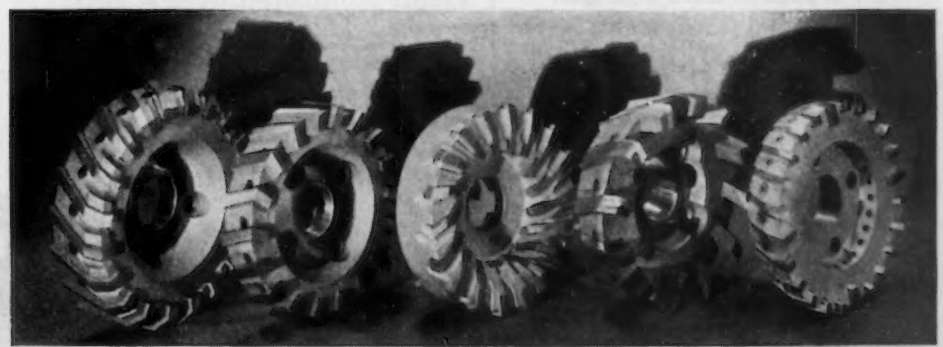
NOTE: *Copies of these charts, suitably mounted for hanging in your tool room, are available upon request.*



To obtain best results with your milling cutters it is essential that they be properly ground. Minor variations may be necessary to suit particular conditions, but satisfactory results will be obtained if cutters are ground in accordance with these charts.

For further information on the technique of grinding milling cutters write for Ingersoll Bulletin No. 54 describing the Ingersoll Cutter Grinder.

Ingersoll manufactures inserted blade milling and boring tools of all types. These are shown in our Engineering Specification Sheets available on request.



SHEAR CLEAR N X RAY BLADE Heavy CONE TYPES Medium

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

Work will be supervised by the Omaha, Neb., District Office of the Corps of Engineers.

Dalhart Airfield, Texas, authorization for construction of hangar, paving, and gasoline storage. Authorized expenditure is $593,000. Work will be supervised by the Tulsa, Okla., District Office of the Corps of Engineers.

Goodyear Aircraft Corp., Akron, Ohio, to provide additional facilities at a plant in Litchfield Park, Ariz., at a cost in excess of $415,000, making a total commitment of more than $9,260,000.

E. I. du Pont de Nemours & Co., to provide for the acquisition of additional equipment and plant expansion at Louisville at a cost in excess of $4,000,000.

Republic Steel Corp., Cleveland, to provide additional equipment at a plant in Birmingham at a cost in excess of $50,000, making a total commitment of more than $2,460,000.

Eastman Kodak Co., Rochester, N. Y., to provide additional equipment at a plant in Rochester at a cost in excess of $200,000, making a total commitment of more than $625,000.

Acme Pattern & Tool Co., Inc., Dayton, Ohio, to provide equipment at a plant in Dayton at a cost in excess of $215,000.

Monarch Aluminum Mfg. Co., Cleveland, to provide equipment at a plant in Cleveland at a cost in excess of $145,000.

Monarch Rubber Co., Inc., Baltimore, Md., to provide equipment at a plant in Baltimore at a cost in excess of $75,000.

Prices Revised on Mining And Construction Equipment

Washington

• • • **In an effort to** move idle construction and mining equipment into essential use, the Office of Price Administration on June 9 issued amendment 117 to MPR 136, which revises ceiling prices on power shovels, cranes, draglines, back hoes, motor graders and crawler tractors manufactured after 1938. This amendment applies to all sales or deliveries on and after June 14, 1944.

The schedule of revision is as follows:

YEAR OF MANUFACTURE	PERCENTAGE OF NEW BASE PRICE
1943	80
1942	75
1941	70
1940	65
1939	60

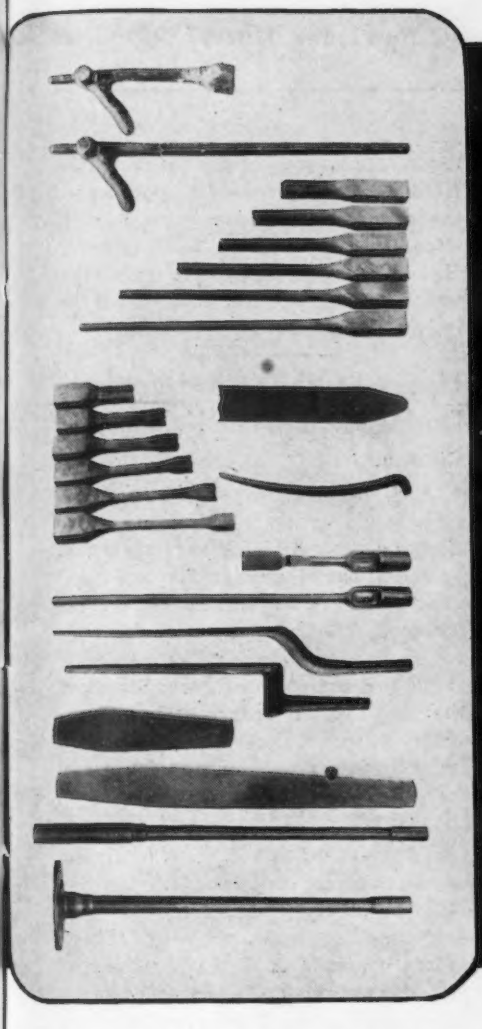
Under the provisions of the new amendment, anyone who purchases a machine for rebuilding and then sells it rebuilt and guaranteed may also add to his rebuilt ceiling price the actual cost of transportation from the place of purchase to the place of rebuilding.

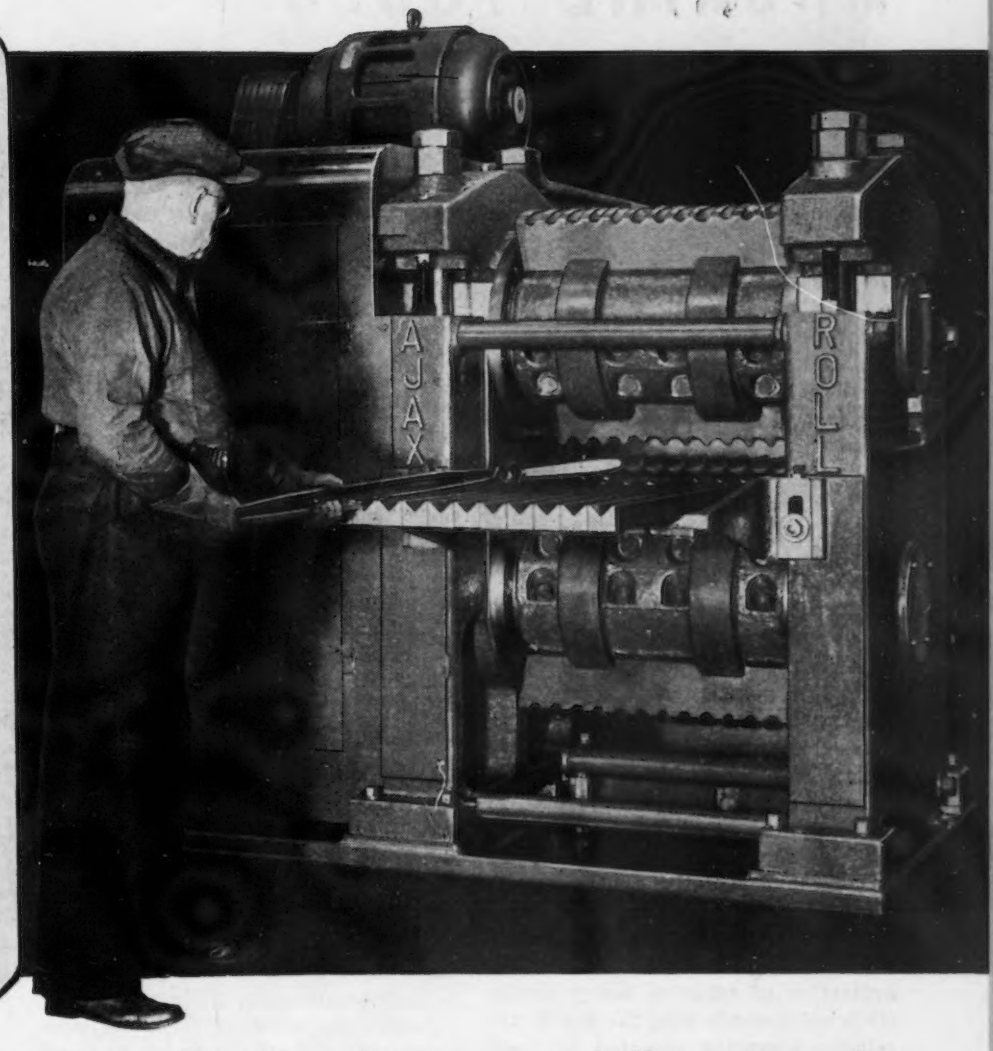
Hyatt Appointed to FEA Post

Washington

• • • **Leo T. Crowley,** Foreign Economic Administrator, has announced the appointment of Comm. Roger Hyatt, USNR as assistant to the administrator in charge of Surplus Property. Commander Hyatt will serve as Mr. Crowley's alternate on the Surplus War Property Board and will direct functions of FEA in connection with transfer and disposition of surplus war property.

AJAX WIDE ADJUSTMENT FORGING ROLLS





The Correct Complement to Forging Presses and Upsetters for Efficient Production of Reduced Straight and Tapered Forgings

★ For high speed, low cost production of many forgings for military and industrial uses wide adjustment forging rolls are of great advantage. These rolls are highly efficient in drawing blanks preparatory to forging in press, hammer or upsetter or for drawing slender shanks on pieces that have been previously forged.

The operation of Ajax Rolls on blanks of steel, aluminum or magnesium is extremely simple and their production of long, uniform reduced straight or tapered sections from blanks of large cross section is many times that of the fastest swagers or hammers.

Today on such products as Rifle Barrels, Machine Gun Barrels, certain types of Bayonets, Automatic Rifle Barrels, Anti-tank Gun Barrels and Airplane Propeller Blanks, alert forging shop operators are establishing new records and gaining valuable experience in the most advanced methods of high speed forging production. And tomorrow, in the competitive post war era, these same operators who have this modern equipment and valuable experience will be the leaders in the production of Automobile Axle Drive Shafts, Connecting Rod Blanks, Spring Leaves, Cable Bolts, Railroad Brake Levers, Brake Shoe Keys and a large variety of other straight and tapered forgings.

WRITE FOR BULLETIN No. 91-A

THE
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EUCLID BRANCH P. O., CLEVELAND 17, OHIO
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MACHINE TOOLS

. . . News and Market Activities

Cooperation Needed on Electrical Standards

Cleveland

• • • **Viewing** at close quarters the electrical problems of the machine tool industry, E. E. Opel, electrical engineer for the National Automatic Tool Co., Richmond, Ind., says, "We need to get together—tool user, tool builder, control maker and code authority. We need to agree on some basic standards which will be accepted as good control and will replace the many customers' specifications that are now being sent out."

Pointing to the trend toward more highly automatic machines as a means of accomplishing labor savings and ultimately lower labor costs per part, Mr. Opel points out that this functioning is centered within the machine tool control. The design of controls, according to Mr. Opel, is complicated by the constant presence of cast iron dust, oil and coolant in every machine shop. Successful service under these constantly adverse conditions requires sound engineering, good material and thorough maintenance. The development and standardization of effective heavy service electrical controls hold the key to the reliable operation required by postwar machine tool users. To this end Mr. Opel appeals for a meeting of the minds of all factors of the industry including the tool user and standards committees so that sound engineering and basic standards may be developed and accepted.

No one knows what doors will be opened by electronic control, he says, but there is a strong demand for more simple mechanical units, possibly driven and controlled by direct current, which is now ready for a comeback.

He warns against the mistakes of 10 or 20 years ago when household type wiring was resorted to for production line service. Pointing out that steel mill service conditions are no more severe than in most machine shops he proposes that following in the footsteps of steel mill service requirements would not be out of line.

Electronic controls should not be considered for mounting in a ventilated box in the dust laden air of a factory; makeshift wiring and inadequate protection from oil and coolants must be avoided if electrical controls are going to take their place alongside the mechanical development of machine tools, Mr. Opel stated. The maintenance men of the tool user are closest to the situation and can help the control maker and tool engineer.

That they have not been satisfied with controls and in general many other features of machine tool design has been evidenced by the large number of customers' electrical specifications that have been appearing and such demonstrations as recently staged by General Motors in which the complaints of maintenance men regarding machine tool design were broadly aired for the benefit of tool builders.

Technical School Named After Bullard and Havens

• • • **An up-grading program** which will introduce the equivalent of two years of college work into Connecticut's free industrial training system was launched with the dedication of the Bullard-Havens Technical School at Bridgeport, on June 2.

The former state trade school was renamed in honor of E. P. Bullard, president of the Bullard Co., machine tool manufacturers, and E. H. Havens, steel merchant and president of the city's Board of Education for 25 years. Mr. Bullard's name was chosen for the school in recognition of his pioneering work in the apprenticeship field. He drew up and caused to be adopted the apprenticeship standards now in effect in the machine tool industry. He also sponsored the legislation which introduced free industrial training in Connecticut.

E. P. BULLARD, *president of the Bullard Co., shown as he spoke at ceremonies dedicating the Bullard-Havens Technical School in Bridgeport.*

E. P. BULLARD

Heavy Machines and Lathes Do Heavy Business Volume

Cincinnati

• • • **Manufacturers of** heavy machines and lathes continue to experience a very satisfactory volume of business, but other machine tool manufacturers are without large business volume. The current war demands which are reported to be stressing shell production has brought about the substantial ordering in lathes, while a recent lend-lease movement from Russia has stimulated the heavy tools.

In most plants that have experienced this influx of new business, production at capacity for the remainder of this year is, at the present time at least, assured. Other plants continue toward conversion to other types of manufacture, but so far there has been no great diminution in the plant operations, except in one or two places.

Amended E-5-a Drops Gages And Gage Blocks from Order

Washington

• • • **Gage blocks,** production and inspection gages and tool room specialties have been eliminated by WPB from General Preference Order E-5-a. In short supply two years ago, these items are now being delivered on a basis almost current with orders. E-5-a controlled them as to sales, which will not be unrestricted.

Control over micrometers and various types of measuring tools is retained by the WPB Tools Division in the amended order. A rating of AA-5 for these tools will be required at the producer level only. The order provides that 20 to 25 per cent of monthly production be set aside for stock orders. Only those purchase orders that bear preference ratings assigned on Form WPB-547, WPB-646 or Canadian Form PD-1010 are included in the term "stock orders."

CADILLAC
Thread Plug
GAGES

National Fine
National Coarse
0-80 to 1½-6
also
Pipe Plug Gages
⅛ to 1¼

CADILLAC THREAD GAGES

CADILLAC GAGE COMPANY
Detroit 5

ALL READY TO SHIP! Standard thread plug gages in sizes 0-80 to 1½-6, National Fine or National Coarse—also pipe plug gages ⅛ to 1¼.

With a plant equipped with the most modern facilities, and devoted exclusively to the manufacture of thread plug and ring gages, we are able to maintain an exceptionally complete range of sizes to fill rush orders for any normal quantity.

The name CADILLAC is recognized far and wide as a hallmark of quality in its particular field. In accuracy and finish, Cadillac Gages are second to none.

Send us an order covering your immediate requirements. If you must have overnight shipment, wire us.

NON-FERROUS METALS

. . . News and Market Activities

Government Views with Alarm Possible Decrease in Copper Output

Denver

• • • **Possible decrease** in mine production of copper by more than 25 per cent between Feb. 1 and July 1, and the possibility of an overall shortage for war and essential civilian uses of 40,000 tons by the end of 1944 is seriously viewed by government officials here.

The slump in production of the metal, which may throw it back into the Group I shortage bracket on WPB's material substitutions and supply list at the end of the second quarter, is attributable directly to loss of labor by the western mines.

The three principal factors have contributed to this exodus of mine labor. Like other industries, the mines have had to yield to Selective Service on the loss of registrants in the 22 to 26 year category. By special Selective Service order, last year these younger men in mining and logging were classified as being practically untouchable by local draft boards.

Secondly, the Army which last Fall released 4500 miners to the enlisted reserve in order to bolster production now has decided to recall these men by age groups in the same order as the national civilian draft. That means that the soldiers up to 26 years go back into uniform leaving the mines without either younger soldiers or civilians.

Confusion as to the essentiality of the various war minerals and the status of employment in the mines as an essential industry is said to have set up a psychological unrest among the mine crews, providing a third main cause for the drift from the mines. Reports that the metals situation is well under control from a supply standpoint has not helped patriotic morale among miners.

Announcement by the War Manpower Commission that it henceforth would control all labor referrals has not had a stabilizing effect upon those employed in those mines with less desirable working conditions but nevertheless essential as to output. In the Fall of 1942, WMC announced that miners and loggers were frozen in their jobs, which had the net result of large numbers quitting before controls could be made effective. The Labor Referral Control announcement apparently has had the same result, with WMC and the United States Employment Service incapable of maintaining strict control in remote sections.

This impotency of the government manpower agencies is tied directly to the fact that many miners turn to ranching during the summer months. With the spectre of being frozen in their mine jobs, this seasonal unrest has become a greater cause of turnover.

To such extent as it may be able, the WMC has been asked by the WPB to give preference to mines and smelters producing certain groups of minerals in channeling labor. It is understood that the highest preference group includes not only copper, but iron, fluorspar, lead, zinc, magnesite, non-curtailed magnesium and aluminum plants, asbestos, and other less common minerals. A second preference group is thought to include molybdenum. Such other ferroalloys as tungsten, chrome, and manganese, as well as once critical mercury, are believed to be entirely absent from any labor preference rating.

•

Copper Mine Production Drops

• • • **Copper production** (in terms of recoverable metal) from domestic mines (including Alaska) was 89,826 net tons in April, a decrease of 4329 tons (5 per cent) from that in March, according to preliminary estimates of the Bureau of Mines. The average daily production in April was 2994 tons, a decrease of 43 tons from the average daily production of 3037 tons for March and an increase of 13 tons over the average daily production of 2981 tons for 1943.

The production of 1322 tons of recoverable copper in the Eastern States remained virtually the same as in March while output from the Central States increased 145 tons over March, or from 3765 to 3910 tons, due to a slight increase in the production from the Michigan copper mines. The production from the combined Western States decreased 4472 tons (5 per cent in April to 89,826 tons, a general shortage of labor at the mines, mills and smelters in the West being largely responsible for this decline. The largest decreases were noted in the production from the three major copper-producing States, Arizona, Utah, and Montana. The production in Arizona in April was lower than in March, the highest monthly production yet reached in 1944, because of decreases at all of the large copper mines in the State. The April production from Utah was the lowest since February, 1943, and was attributable to a labor shortage which cut back the production rate at the Utah Copper Co. The Montana production showed a decrease due to the fact that the Anaconda Copper Mining Co. was forced by a shortage of labor to treat a higher tonnage of dump material than crude ore. Only slight increases of varying magnitudes were noted from several of the Western States.

•

Rolled Zinc Output Drops

• • • **Increased consumption** of slab zinc for essential needs and the continuation of limitation orders have resulted in a marked reduction in the amount of slab available for the production of rolled zinc in 1943. In 1942, 66,429 net tons of rolled zinc were produced, compared with 48,126 tons in 1943. Allowances made for imports, exports and changes in producers' stocks reduced this figure to 62,272 net tons available for consumption in 1942 and 46,111 tons in 1943.

During last year, the rolling mills reported the consumption of 48,566 tons of slab zinc, including 37 tons of remelt zinc, and 811 tons of purchased zinc scrap compared with 66,045 tons and 2,023 tons, respectively in 1942. In addition, 12,809 tons of strip and ribbon zinc were rerolled from scrap originating in fabricating plants operated in connection with zinc rolling mills.

REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 12.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercal bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base. 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.375
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00

Plant scrap, mixed

All solids	6.00
Borings and turnings	4.00

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

WPB Points to Low Scrap Stocks

• • • According to WPB Steel Division records, inventories of scrap are approaching the 4,000,000 tons danger mark reached in 1941 when furnaces were forced down for lack of scrap. The division does not expect that furnaces will shut down this year as inventories are more evenly distributed than they were in 1941.

Shipments from dealers' yards and inventories show a steady decline from April, 1943, to February, 1944, on both national and regional bases. The usual March increase was smaller this year than it was last year. Consumers' receipts of iron and steel scrap rose during 1942 due to scrap drives reaching a peak in November. Since then, the trend has been downward with a slight but inadequate increase since March, 1944.

Consumers' inventories of cast scrap have dropped from 1,298,000 tons in January, 1943, to 766,000 tons in March, 1944, a decrease of 40 per cent. April figures indicate a further decline of 100,000 tons. Dealers inventories are at the lowest point on record, approximately 700,000 tons, and prospects for an increase are not encouraging. The all-time high was 2,000,000 tons in 1939-40.

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PITTSBURGH—While carbon and alloy turnings and alloy solids are going begging for buyers, the market here on the heavier grades of carbon steel scrap for open hearth has tightened up. Two of the major consumers in the western Pennsylvania and eastern Ohio area have come back into the market after about two weeks of no demand. Consequently, the situation here on open hearth grades has tightened up considerably.

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CHICAGO — Although a large order placed at ceiling prices for shoveling turnings has contributed to the steadiness of the market for blast furnace material, the transaction has yet to be confirmed in subsequent deals by other purchasers. Nevertheless, this order is important in that it marks the first time in many weeks that a purchase has been made of blast furnace material without a substantial discount from ceiling prices. Allocation of short turnings from southern Indiana to the Cleveland market, which will result in payment of higher than springboard prices there also provides a bullish omen.

It must be emphasized, however, that until these transactions are followed up, no change in the market condition can be considered to have taken place. Contrary to reports from other points, a continuing market at ceiling price exists here for the better open hearth grades, but the market for machine shop turnings remains stagnant. Overall, the market must continue to be considered selective.

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BOSTON—A steady increase in supply of electric furnace scrap is noted, consumption of which is limited due to regulations. Brokers endeavoring to obtain allocations to steel mills are referred to the OPA, and that is as far as they get. In contrast, the cast iron supply is drying up and other grades, for which there is a ready sale, are not always to be found, say brokers. Breakable and machinery cast just do not exist.

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PHILADELPHIA — Some relief came to yards and brokers early this week as one mill lifted its embargo to accept restricted scrap shipments. However, no consumer, it seems, wants more than a balanced flow so that stockpiles are not increased. New contracts involving turnings for the second half of the year have been made at $1.00 to $1.25 below the ceiling price and with no allowance for springboard. For low phos, which has been sold at 75c. to $1.00 below the ceiling, springboards will be paid.

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BUFFALO—Delivery of heavy melting and compressed bundles by barge canal to the district's leading consumers is continuing on a large scale. Total haul to date is approaching the 45,000-ton mark. No letup is in sight and it is now virtually certain canal scrap shipments will set a new all-time record. Meanwhile, dealers do not appear to be heavily stocked and are operating on a nominal basis with inadequate labor. A heavy buyer is reported offering $12.50 for steel turnings, 50c. a ton below the last sale, with no takers. One steelmaker has returned one of his two stacks to basic iron after a whirl at merchant production, and the second shipment of pig iron to move eastward from Buffalo has started down the canal.

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CINCINNATI—The district scrap market has turned listless, with many consumers discontinuing purchasing while others are restricting their present commitments. Movement on contract is not changed, but the market tendency is toward car acceptance. The market, however, is being supported by strength in other districts, but dealers generally say that the present underlying tendency of the market is toward a buyer's market. Pressure on specifications continues stronger, but, so far, dealers report that they have been able to adhere to ceiling prices, although the ease of adherence becomes more difficult.

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BIRMINGHAM — Demand for open hearth grades in this area has taken a sharp downward turn, and blast furnace scrap buying is spasmodic. The market is weak for cast iron grades although some buying exists on a restricted freight rate basis. No demand currently exists for foundry grades of steel scrap.

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ST. LOUIS—Mill inventories of scrap iron are heavier than for some time as result of heavy shipments from war plants, cutbacks and recent strikes. Farmers are busy in wheat fields, causing slackening of movement from agricultural areas.

WORKER SPIRIT: *John Wozny, a crankshaft grinder at Ohio Crankshaft Co., Cleveland, designed these departmental insignia for the company's production departments. They are patterned somewhat after those of the fighting units of the Air Forces and each has its own symbol as well as the part produced by the department.*

IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
							Low Phos.	Heavy Structural and Plate				Foundry Steel				
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shoveling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	....	12.85	12.85	13.85	14.85	15.35	....	....	....	....	....	....	....	....	....	....	....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles, Pittsburg, Cal; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on trucks. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing point (cents per gross ton) are: Chicago, 84c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, Pittsburg, 42c.; Seattle, 38c.; Buffalo, Claymont, Harrisburg, 36c.; Atlanta, Birmingham, 32c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Phoenixville, Bethlehem, Kokomo, Duluth and St. Louis, 28c.; Alabama City, Ala., 26c.; Minnequa, Colo., 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

*Basic open hearth and foundry grades, and auto springs and crankshafts, deduct 80c. per ton.

BASING POINT includes switching districts of city named.

Basing point	Switching districts:
Pittsburgh	Bessemer, Homestead, Duquesne, Munhall, McKeesport
Cincinnati	Newport
St. Louis	Granite City, E. St. Louis, Madison, Ill.
Chicago	Gary
Claymont	Chester, Pa.
San Francisco	So. San Francisco, Niles, Oakland

MAXIMUM SHIPPING POINT PRICE: Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel. For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph above labeled "Switching Charges." (b) For shipping points outside basing point, price listed in above table hereof for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. Where vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; $1 at Great Lakes ports; and $1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less than maximum prices for the corresponding prepared scrap. In no case, however, shall electric furnace, acid open hearth and foundry grades be used as the corresponding prepared scrap. A preparation-in-transit charge for unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced less $2; 75 to 85% Fe less $4; under 75% Fe less $8 per ton. Mill scale less $8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1% oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5% oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c. mill scale, $8 less than No. 1 heavy melting.

Tool Steel Scrap Prices (MPR 379)

	SEGREGATED Solids Per Lb. Cont. W	SEGREGATED Turnings Per Lb. Cont. W
Type 1. 12% min. W, 1% max. Mo	$1.60	$1.60
Type 2. 5 to 12% W, 1% max. Mo	1.60	1.40
Type 3. 1 to 5% W, 1.5% max. Mo	1.25	1.25
*Type 4. 7% min. Mo, 2% max. W	0.125	0.105
*Type 5. 3.5 to 6% Mo, 4.5 to 6% W	0.135	0.115

UNSEGREGATED SOLIDS	UNSEGREGATED TURNINGS
$1.50 per lb. contained W if 5% or more.	$1.30 per lb. contained W if 5% or more.
$1.15 per lb. contained W if 1 to 5%.	$1.00 per lb. contained W if 1 to 5%.
$0.80 per lb. contained Mo if 1.5% or more.	$0.70 per lb. contained Mo if 1.5% or more.

If both W and Mo are within ranges, payment may be for both W and Mo content.

*Per lb. of scrap material.

If segregated, a premium of $1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%.

If Cu or Ni content over 0.25%, price shall be reduced by 50%.

If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

Cast Iron Scrap

Maximum on-line price, per gross ton, for any of the following cast grades will be the price shown at the highest priced zone in which the railroad operates or is located.

	Per Gross Ton		
	Zone A	Zone B	Zone C
Cast Iron, No. 1	$18.00	$19.00	$20.00
Cast Iron, No. 2	17.00	18.00	19.00
Cast Iron, No. 3	14.50	15.50	16.50
Cast Iron, No. 4	13.25	14.25	15.25
Cast Iron Brake Shoes	13.25	14.25	15.25
Malleable	20.00	21.00	22.00
Wheels, No. 1	18.00	19.00	20.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

For cast, an in-transit preparation fee will be applicable only for preparing Cast ron No. 3 into Cast Iron No. 1, for which the maximum preparation fee shall be $3.50 per gross ton. (Previous dealer fee was $2.50.)

CAST IRON GRADE DEFINITIONS: Cast Iron No. 1—Cast Iron scrap such as columns, pipe, plates and/or castings of miscellaneous nature, but free from stove plate, brake shoes, and/or burnt scrap. Must be cupola size not over 24 x 30 in. and no pieces to weigh more than 150 lb. Free of foreign material. No. 2—Cast iron scrap in pieces weighing over 150 lb. not more than 500 lb. and free from burnt cast. No. 3—Cast iron scrap in pieces over 500 lb., includes cylinders, driving wheel centers, and/or all other castings. Free from hammer blocks or bases. No. 4—Burnt cast iron scrap such as grate bars, stove parts, and/or miscellaneous burnt scrap. No. 5—Driving and/or car brake shoes of all types except composition filled. Malleable—Malleable parts of automobiles, railroad cars, and locomotives. No. 7—Wheels, No. 1, includes cast iron car and/or locomotive wheels.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. (Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	June 20, 1944	June 13, 1944	May 16, 1944	June 22, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	June 20, 1944	June 13, 1944	May 16, 1944	June 22, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 151-159.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 20, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applise to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price to be used in figuring annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[12]			3.37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)		(Toledo = 2.80¢)					2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)							2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95		4.15¢		3.70¢	3.58¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem = 2.10¢)				2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base.															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.53¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel Co. $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast Ports.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pacific Coast ports.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron & Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Dic., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base. f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight ville; Medart Co. in certain areas, Chi- Buffalo to Readville, Mass. f.o.b. Readcago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base. f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana. Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-48 Ann.
**Philadelphia	3.518	4.872[6]	5.018[a]	3.922	4.772	3.605	3.668	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.062	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.659[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.813[3]	3.813[3]	3.763[3]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215		4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45		4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.203	6.104	4.95	5.813[18]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.304	6.354	4.50[14]	7.333[17]	4.85[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.054	5.954	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.604	5.754	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.171[8]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS

(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10c	$2.00	.....	.....
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25c	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25	.....	.....	.65	13.00	.....	.....
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40	.....	.....	.65	13.00	.....	.....
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(*) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports)*

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1¼ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	**U.S.S.**	**S.A.E.**
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	....	*28.00*	....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*		.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	...	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	...	24.50			29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50			...	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*		*25.11*	...	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.89*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	..	....	...	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	...	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	....	.....	...	.....	.....	34.00
Lyles, Tenn. fc. (2)	....	.....	...	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum power, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	***Per Net Ton***
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton $40.00
Angle splice bars, 100 lb. 2.70

(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphoros or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per usual freight allowances, per lb. contained Va.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88%-98% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5 ..... $1.10

Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload $1.20
- Under 2000 lb. 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload ..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload ..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb. ..... 45c.
- Less ton lots, per lb. ..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots $2.25
- Under 2000 lb. lots $2.30

Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
- Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo ..... 80c.

Molybdenum oxide briquetes, 48%-52% Mo, f.o.b. Yangeloth, Pa., per lb. contained Mo ..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo ..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.

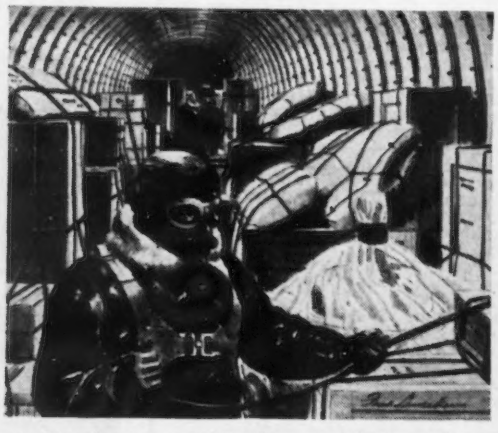
This advertisement is one of a series which is appearing in national magazines and newspapers as Consolidated Vultee's contribution toward a clearer public understanding of transportation's role in the war, and its postwar opportunities and responsibilities.

The Story of "The Hump"—the world's most dangerous overland air route

1. **Today, American airmen** are ferrying a greater tonnage of military supplies to hard-pressed China than was ever carried over the tortuous Burma Road. They're flying it over "The Hump"—the towering Himalayas between India and China. It's the most treacherous 500-mile air route in the world. *But the freight goes through!*

2. **The first leg** of the journey is over the steaming, foggy Assam jungles. Because there are no emergency landing fields, some of the planes have crashed. But most of the men who bail out eventually plod their way to safety, aided by rescue pilots, who drop written instructions, food, and medical supplies by parachute.

3. **Day and night,** the heavily loaded Liberator Express transport planes streak toward "The Hump." Shuttling across a tumbled mass of uncharted mountains, they dodge peaks that rise 20,000 feet. Icing is an ever-present hazard. Flying unarmed, the cargo planes are often attacked by Jap fighter planes. *Still the freight goes through!*



4. **This slender aerial life line** over "The Hump" is now the *only* channel by which Allied war equipment gets into China. Around the clock, in monsoon season and out, our flyers carry a constant stream of gasoline, bombs, jeeps, ammunition, artillery, small arms, clothing, aircraft engines and spare parts.

CONSOLIDATED VULTEE